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AVIATION

The Oldest American Aeronautical Magazine

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REVIEWING THE *New York Show*

CREATIVE *Wing Design*

Lighting LOS ANGELES AIRPORTS

At the doorstep of 3,500,000 people

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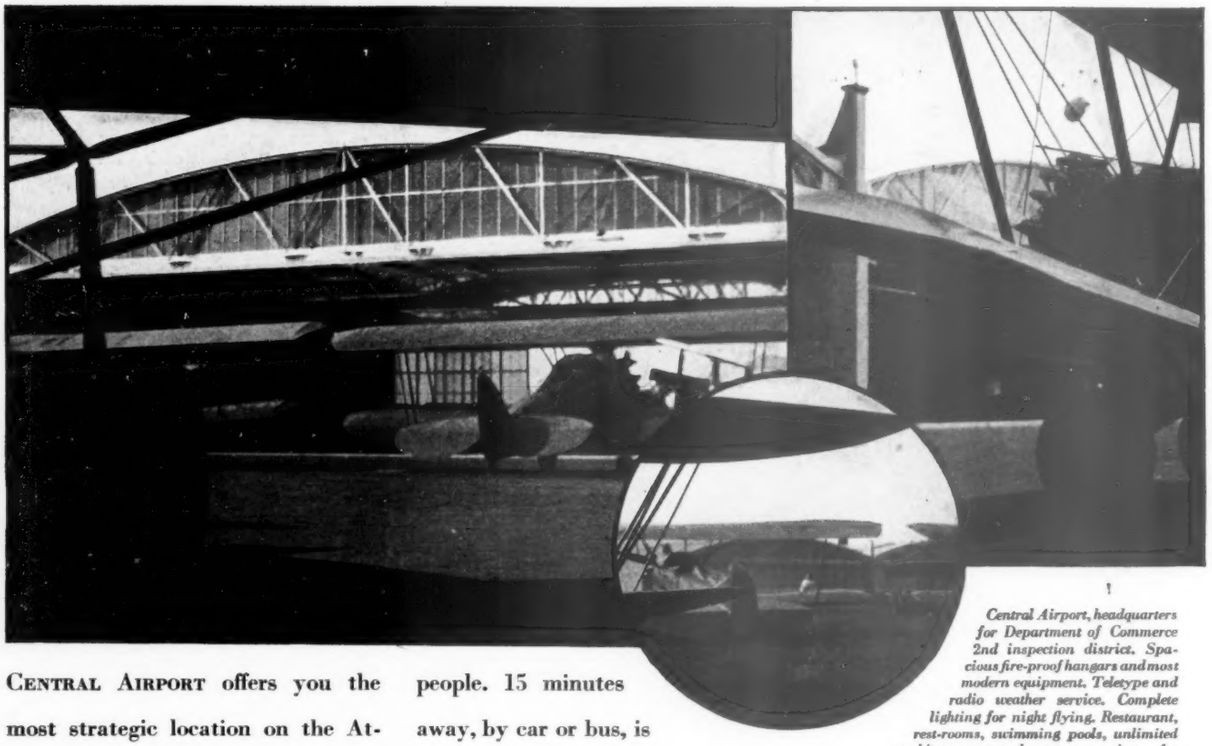

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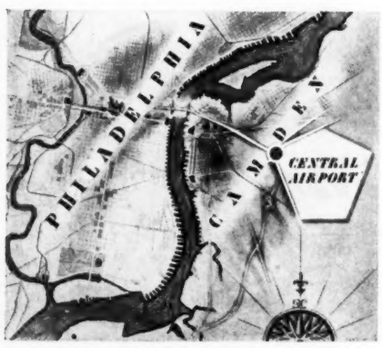

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AVIATION

The Oldest American Aeronautical Magazine

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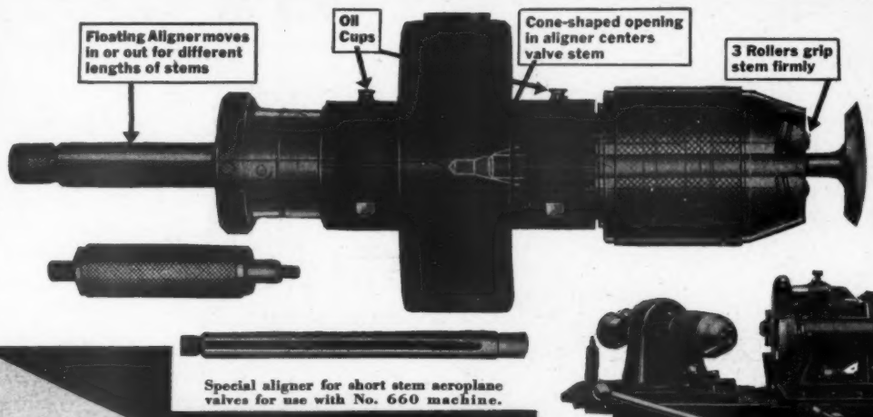
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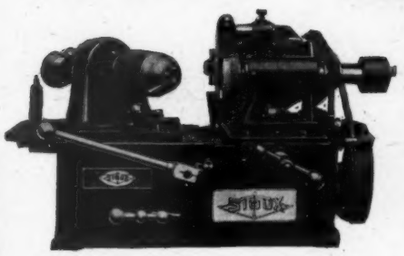

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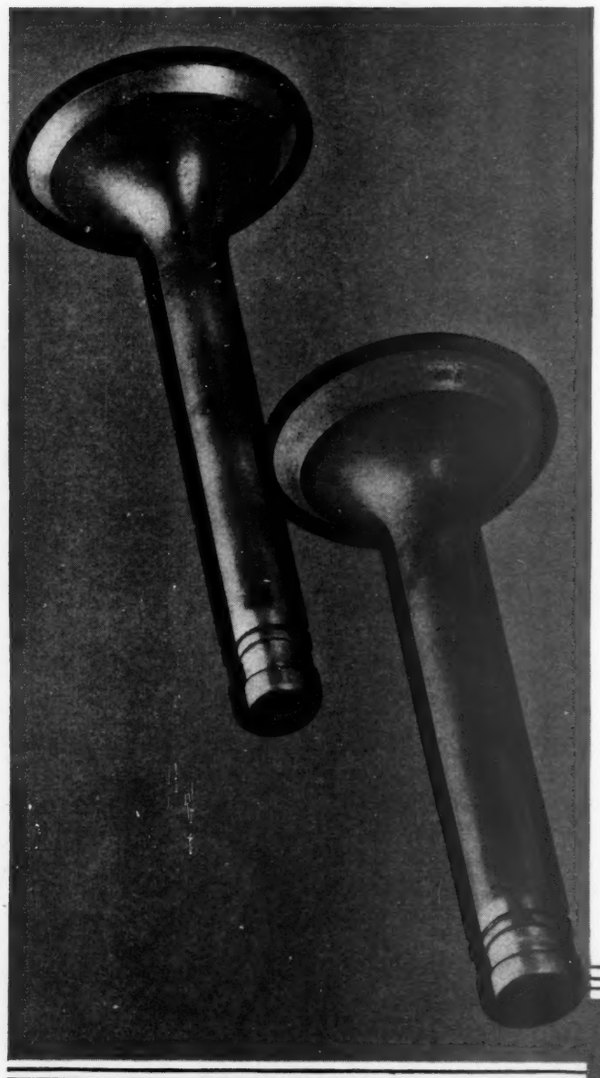

Unretouched photograph of two of the 18 Thompson Valves that served in the Angeleno's famous flight. Taken soon after the landing.

Thompson Valves

(This advertisement is one of a series showing Thompson Valves from some of the historic aero motors that used them in setting new world's endurance records.)

. . . from the "Angeleno"

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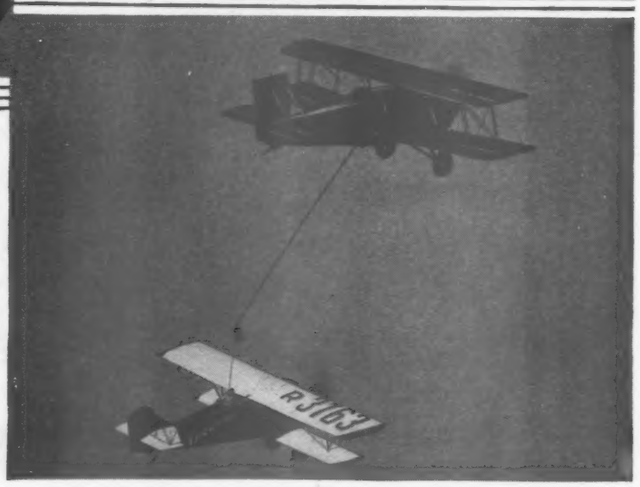

Turning Seconds Into Miles and MILES into SMILES

THE AMERICAN EAGLE WAY!

American Eagle airplanes have a way of getting close to the heart. Anything does when it proves its friendship by faithful performance in deed and steadfastness.

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There's inbuilt comfort and ease of riding in American Eagles—they take you there surely, speedily and you're as fresh as the dew when you alight at the journey's end.

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In designing, constructing and equipping the United Airport of the Boeing System at Burbank, California, Austin not only exhibited its ability to create an efficient air terminal, but also added the features that make this a port of today . . . with facilities for tomorrow. There is an up-to-date depot with restful waiting rooms . . . a promenade from which guests may watch activities . . . modern passenger loading.

Austin Engineers, experienced and capable, also concentrated their efforts in planning the runways, the lighting, the hangars, etc. The result is obvious to all who have inspected the United Airport . . . on land or from the sky. It is thoroughly efficient, modern and safe.

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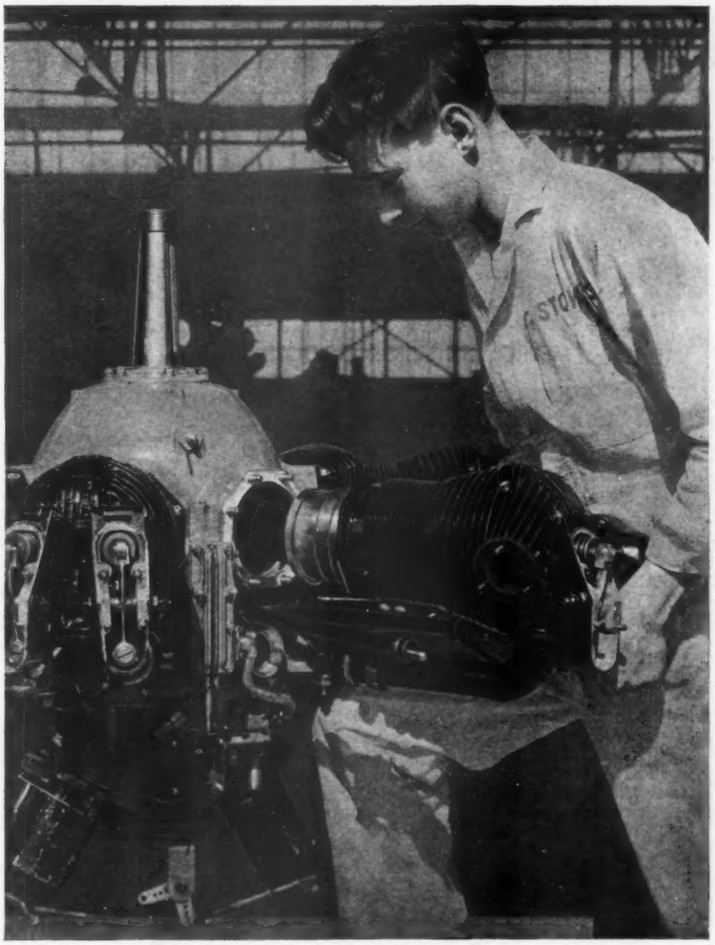
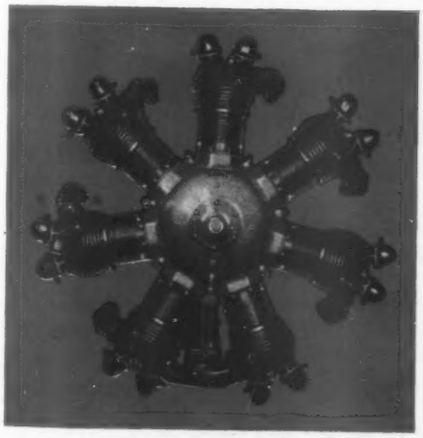


It's an Economical Engine to OVERHAUL



Simplicity in the design of the Axelson Airplane Engine permits convenient access to every part and minimum time is required in disassembling for an overhaul. A top overhaul can readily be made without dismounting the engine from the aircraft. Exacting care in the manufacture of each part permits standardization and interchangeability. Without sacrifice of horsepower, every part is extremely rugged and tested to withstand the strains imposed in flying service. It is a really fine engine, manufactured by an organization that has 38 years of experience in the manufacture of fine tools and accurate mechanisms.

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NON-SHATTERABLE LENSES
with flaring featheredge cushions

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With white optically ground and polished (Navy Type) meniscus spherical lenses	18.00
With tinted Amber No. 1 or 2 shade or euphos (green) 1 or 2 shade optically ground and polished meniscus lenses	19.50
With optically ground and polished Calobar meniscus lenses	21.00
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NEW TYPE ASYMMETRICAL DOUBLE LIP SPONGE RUBBER CUSHIONS PREVENT ROLLING
(Patented)
LENS CLAMP
VENTILATION INLETS IN METAL FRAMES

MEYROWITZ LUXOR GOGGLE
U.S. Air Service Model No.7

Luxor Goggles No. 7
U. S. Air Service Model

With first quality white cylindrical bent lenses	$13.75
With first quality amber or euphos (green) and smoke tinted cylindrical bent lenses	15.75
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With amber or euphos (green) tinted hand ground and polished meniscus lenses	19.50
With white cylindrical ground and polished lenses in accordance to U. S. Army Specification No.3024	20.00
With white cylindrical ground and polished decentered lenses in accordance to U. S. Army Specification No. 3024-B (If one lens is broken, the other must be returned to be matched)	22.00
With white hand ground and polished decentered meniscus lenses in accordance to Navy Spec. No. 285-D	22.00
With optically ground and polished **NON - SHATTERABLE** meniscus lenses	34.00

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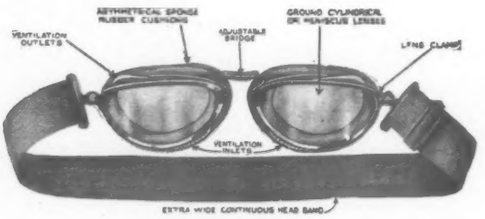
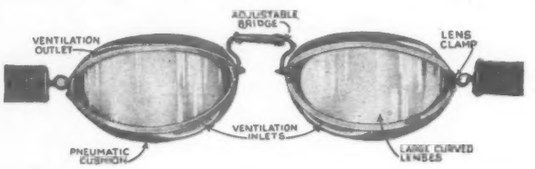


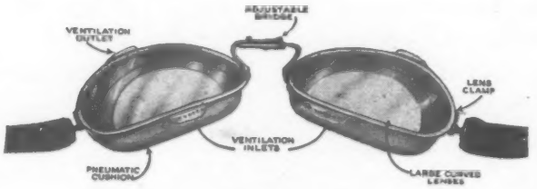
Luxor Goggles No. 6
U. S. Air Service Model

With first quality white cylindrical bent lenses	$10.75
With first quality amber or euphos (green) and smoke tinted cylindrical bent lenses	12.75
With white hand ground and polished meniscus lenses	15.00
With amber or euphos (green) tinted hand ground and polished meniscus lenses	16.50
With white cylindrical ground and polished lenses in accordance to U. S. Army Specification No. 3024	17.00
With white cylindrical ground and polished decentered lenses in accordance to U. S. Army Specification No. 3024-B. (If one lens is broken the other must be returned to be matched)	19.00
With white hand ground and polished decentered meniscus lenses in accordance to Navy Spec. No. 285-D	19.00
With optically ground and polished **NON-SHATTERABLE** meniscus lenses	32.00



Luxor Goggles No. 6 Regular Model

With first quality white cylindrical bent lenses	$9.75
With first quality amber or euphos (green) and smoke tinted cylindrical bent lenses	10.50
With white hand ground and polished meniscus lenses	14.00
With amber or euphos (green) tinted hand ground and polished meniscus lenses	15.50
With first quality white cylindrical lenses (with sun shields)	11.75
With white cylindrical ground and polished lenses in accordance to U. S. Army Spec. No. 3024	16.00
With white cylindrical ground and polished decentered lenses in accordance to U. S. Army Specification No. 3024-B. (If one lens is broken the other must be returned to be matched.)	18.00
With white hand ground and polished decentered meniscus lenses in accordance to Navy Specification No. 285-D	18.00



Luxor Goggles No. 5

With first quality white cylindrical bent lenses	$7.50
With first quality amber or euphos (green) and smoke tinted cylindrical bent lenses	8.25
With white hand ground and polished meniscus lenses	12.00
With amber or euphos (green) tinted hand ground and polished meniscus lenses	13.50

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520 Fifth Ave., Dept. B, New York

AVIATION

THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

A McGRAW-HILL PUBLICATION . . . ESTABLISHED 1916

EDWARD P. WARNER, *Editor*

VOLUME 28 . . . *May 17, 1930* . . . NUMBER 20

Shows or "Shows"?

TALK about shows, and you are sure of an audience. For some months past, that subject has been an unfailing hit with any aeronautical gathering. Are there too many shows? Are there enough? Are they the right kind? Where should they be held? When? Why? An so on, ad infinitum.

Before contributing to this wilderness of words that eddies perennially arround the subject, we propose to take a lesson from an individual who lived four thousand miles from Kitty Hawk, and died two thousand years before the airplane left the realm of mythology. "First," said Socrates, and he said it with such persistence that acquaintances fled at his approach, "define your terms." More colloquially, "whaddya mean, show?" What is an aircraft show, and what ought it to be? Has it one purpose, or several, and should the same one always be dominant? If we had a clearer idea of just what it is that we are talking about, and of just what ideal we ought to have before us in all this discussion, we would be in a better position to decide intelligently how many shows are worth the industry's while, and how much money can properly be spent upon them. We have visited, from time to time, aircraft shows variously designed to: (a) Sell airplanes at retail to the public; (b) Sell airplanes at wholesale to distributors; (c) Make the population of the vicinage "air-minded"; (d) Provide an added ballyhoo for a radio exhibit that was threatening to drag anchor financially; (e) Give engineers an opportunity of comparing the latest technical developments; (f) Support a worthy charity; (g) Line the pockets of the professional promoters; and so on, also ad infinitum. All very worthy aims, but not all of equal importance to the aircraft industry.

If our object be to compare notes on progress in design, to provide a convenient occasion for the gathering of the clans, or to reach a group of important transport operators and major distributors, we may reasonably fix attention upon a single national show, or two at most, one east of the Rockies and the other upon the Pacific coast. To accomplish any enterprise on a truly and uniformly national scale is a matter of extraordinary difficulty in a country the size of this one, and a large proportion of the planes and engines originated on the west coast were absent from the recent St. Louis and Detroit exhibitions.

If, on the other hand, we are trying to sell airplanes to the general public we must go where they are to be found. We must take the shows to their home towns, and hold not merely three or four exhibitions but something between a score and a hundred. If the object of such local displays is to sell airplanes, there should be no effort to attract the attendance of those who are, and seem likely to remain, far from the financial stratum of society in which planes may be bought. If what we are seeking is the production of air-mindedness, with the ultimate object of improving the municipal airport or securing more liberal patronage for the air mail. all comers are welcome and any sort of a side-show that increases the attendance is helpful.

One *national* show, or at most two in widely-separated parts of the country, is quite enough. The industry can stand no more under present conditions, but there need be no suppression of local exhibitions, planned for quite a different purpose. The objection to such shows in the past has been to their refusal to stay local. Every community has tried to make it clear that *its* show was to be the biggest on earth. It has been a poor-spirited Chamber of Commerce that could not evolve some such descriptive adjective as international or supernational or universal, and then the screws have been put on the poor aircraft industry to help make good.

The Aeronautical Chamber of Commerce ought to

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back its members in standing absolutely firm against any such pressure. Its first step in clearing up the situation should be the abolition of the Class B sanction. There should be no transition stage between the show of first-rate national importance and that which is purely local and supported only by the local dealers. The first group must be extraordinarily select, more so than it has been this year. The second can vary its dimensions to meet the needs of the moment. Dealer shows, which can and should be staged very modestly and inexpensively, belong on the calendar wherever the manufacturers' local representatives want them. Theirs should be the burden of support, and they should get the kind of show they want to pay for, and get it when they want it. Sanction must then be conditioned on the management's making appeal for exhibits only to, and conducting its negotiations only with, the local people.

//

The Factory Learns from the Field

AVIATION, perhaps to a greater extent than any other industry, has taken advantage of the value of detail shop contacts for the designers and draftsmen. Involving as it did an intimate and expert knowledge of so many basic industries, it was but natural that aircraft building should develop the fullest degree of contact between designer and production man. The draftsman has been allowed to look from his drafting board to gain an increased general knowledge that would provide the key to economical production. It has paid well to wed theory and practice, for in the present state of the industry's development good detail design is the direct consequence of having a well-informed drafting force.

There is, however, a growing need for the extension of this drafting contact to the flying field. It is not enough for major executives to extol the virtues of easy serviceability. That again is a detail problem, only successfully met by the amalgamation of many personal observations and first-hand experiences into a composite whole.

Only with amazing infrequency do aeronautical draftsmen put in an appearance at a flying field.

Major overhauls of plane and engine, often done at the manufacturer's plane disclose a great deal of useful information to the draftsmen, but the really significant phases of everyday serviceability, only brought out at the operation field itself, are overlooked. Chief engineers, to be sure, usually have more than a passing acquaintance with actual flying operations, but theirs are the broader basic problems of design and they can hardly be expected to find time to pay a great deal of attention to the details of the tribulations of the "grease monkey."

Yet the humble service mechanic is a powerful influence. The prospective plane purchaser, perhaps none too intimately acquainted with aviation, may anonymously seek some first-hand information at the operation field and to evade the enthusiasm of a pilot salesman. To him, the service mechanic may represent direct expert advice. The fate of an impending sale of a particular type of plane with which the mechanic has been struggling all morning to lubricate some wholly inaccessible points and trying to inflate a particularly-hard-to-reach tire hangs in the balance.

It is not only a question of the convenience of the mechanic. If necessary service is made too difficult of accomplishment it is always expensive and it is often likely to be neglected or overlooked. On such detail attentions depends the length of life and the reliability of a plane, and prospective purchasers of planes, of automobiles, are looking rather closely into questions of "serviceability" when buying.

Securing service contacts for the draftsmen is not as easy as getting him out into the shop, for there is less direct excuse for his presence at the field during working hours. It is however possible, by proper consideration, to encourage him to spend some of his leisure time in contact with actual flying operations. He should be encouraged both morally and financially to seek some flying training, either through the medium of an actual flying instruction course or through a flying club. If that cannot be arranged, he should be made to feel welcome at all times at the flying field, with the hope held out that in any flying demonstration or test in which there are facilities available for additional passengers he will be on the preferred free list.

The proportion of aeronautical draftsmen who have never even flown in a plane is far too large for the general good of the industry. Of great import for the improvement of design from the point of view of service is the indoctrination of draftsmen and junior designers with flying field atmosphere. Serviceability becomes an increasingly important aspect of aircraft design. Distinctly a detail problem, it should be kept before the eyes of those most intimately associated with design detail—the draftsmen.

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On Racing Rules

THERE IS a dilemma that confronts all mechanical sport: motor boating, automobile racing, and motorcycle contests have been common sufferers. No one has ever yet devised a satisfactory means of rating internal combustion engines for competition which will at the same time be simple in application, make trickery difficult, and avoid the encouragement of freak design and fit for any commercial application.

The airplane is set upon the same path that has been fraught with so much annoyance, and such unanticipated and unfortunate results, for high speed vehicles of the

water and of the highway. There may be no reasonable escape from that course, but at least we should realize where we are going.

For a number of years, almost since the beginning of the national air races, competing planes have been grouped in classes in terms of the displacement of their engines. That has been strictly in the automobile tradition, and the ultimate result will, we predict, likewise be in accord with automobile experience. As competition in the industry becomes keener, and as racing becomes the object of more anxious solicitude on the part of manufacturers, we shall see engines designed, built, and put through their Department of Commerce tests with employment in speed competitions as their ultimate object and with the beating of the existing rating rule as the fundamental motive in their design.

When racing started on the speedway at Indianapolis, the competing cars were fitted with engines not dissimilar from those of the passenger vehicles in general use at the time. With the passage of years, the racing car and its power-plant have been developed along lines utterly distinct from anything that finds its way upon the highway. A speed of 6,000 r.p.m. has become commonplace. Supercharging has been carried to the limit possible without continuous detonation. Better fuels have been refined, and more dope has been added to them, and the supercharger has been stepped up again. The Indianapolis engines of 1929 were developing approximately 1.7 hp. per cubic inch of piston displacement, or from seven to ten times a good commercial standard.

The same thing has happened upon the water. Except in the outboard engine field, where the governing body has waged a constant struggle against specialized racing design by the enforcement of elaborate technical stipulations, engines have increased in performance and in cost as rapidly as they have diverged from anything that can be considered suitable for general use.

Perhaps the parallel is not yet apparent for the airplane, but still we foresee that a continuance of the piston displacement rating rule is going to lead within the next ten years to the production of engines of small displacement, with very high compression ratios and supercharged to the limit, running at immense speed and geared down to the propeller, far too heavy and too wasteful of fuel for practical employment, just barely able to live through a Department of Commerce test (assuming that an approved type certificate continues to be required for all racing machines), but putting out a relatively enormous power per unit of volume.

Limitation of engine weight also has been suggested as an alternative for the displacement system and this method actually has been employed in some of the light plane contests abroad.

In aviation, the high performance engine, running supercharged and with special fuels and thereby reducing its weight and frontal area, has a larger place than in any other field, but its development may easily run too far in the wrong direction, and too much can easily be sacrificed on the altar of maximum power output.

Having prognosticated gloomily for the outcome of the present practice, we frankly admit that we do not know just what to do about it. An obvious alternative is to classify by Department of Commerce power rating, rather than by piston displacement, but, equally obvious as an effect of that plan, propellers would then be cut down in diameter or reduced in pitch angle and the engines would be run to far beyond their rated r.p.m. and power. Racing engines, in fact, might well be deliberately given a low rating by taking their Department of Commerce test at a reduced r.p.m., in anticipation of just such an increase in power output for competitive purposes.

Limitation of fuel is a possibility, and it has been successful in certain European motorcycle and automobile road races in the past. Instead of limiting to 800 cubic inches of piston displacement, the limit might be to one gallon of fuel for every ten miles, a scheme theoretically sound but full of practical drawbacks. The opportunity for fraud is obvious, protests are sure to ensue, and the winner of a race can never be determined until the contents of all fuel tanks have been checked up and the penalties levied for minor excesses of consumption have been applied. As a practical matter it must be thrown out of consideration as a ruling for general use.

A rule might be made, and on the whole we think this is the most promising suggestion, that all engines used must not only have received their type approvals but also have been built to the number of at least fifty (50) examples and installed in a like number of aeroplanes. The obvious flaw there is that very interesting and truly commercial engines in their developmental stage would be relegated to the experimental races. To be quite candid, none of these alternatives satisfy us at all. For the present, the continuance of the flat piston displacement rule need hardly be challenged. In the future, we are very much afraid it is going to make some trouble and encourage undesirable design tendencies. At least, its potential consequences demand careful consideration by the industry, and a substitute may thus be brought to light.

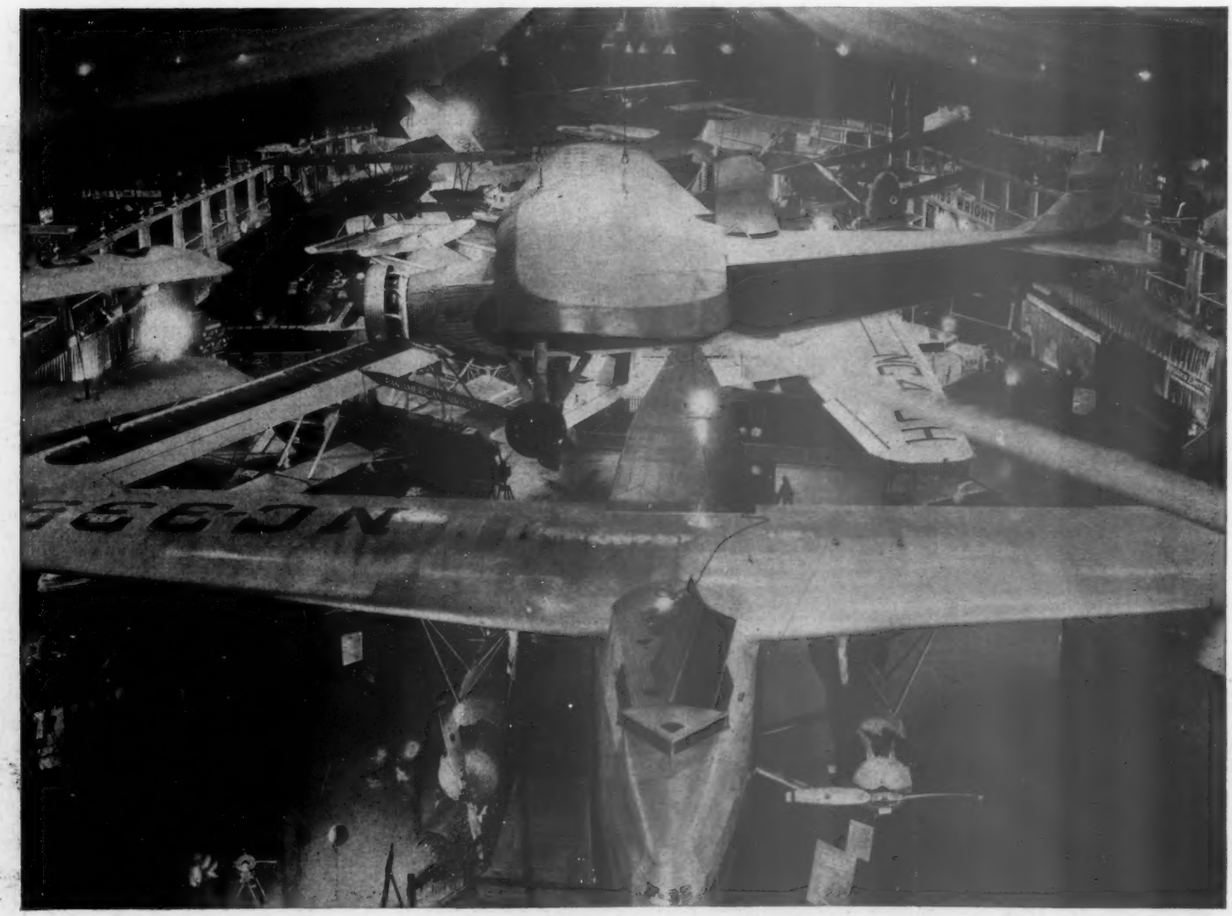
Whatever rule is adopted, it should be left as nearly as possible static from year to year. In the past, the classifications of piston displacement have been governed largely by the volume of certain engine types in extensive use and, in particular, they have worked up and down from the 510 cubic inches of the OX-5. For this year, an attempt has been made to arrive at a logical grouping of size limitations. They should be carefully considered, modified where necessary, then allowed to remain as standard. Let the critic speak promptly, or else prepare to hold his peace. For the future, air racing should follow the rule established by the Indianapolis speedway, that no change in fundamental technical specifications affecting the design of planes and engines should become effective in less than a year, or even two years, after notice.

IMPRESSIONS OF THE *New*

Exposition Held Last Week at Madison Square Garden Included

TO THE VISITING MEMBERS of the public the New York Aircraft Salon was a rather interesting affair, but to the visiting members of the industry it was just another air show. In fact, it might be stated that the New York exhibit proved to be somewhat of a disappointment. However, it should not be taken that the failure of the show to come up to expectations was the result of poor or inadequate management. The Show Committee worked hard and, we believe, left no stone unturned to make the Salon a success.

Of course the main idea of the Show was to further acquaint the public with the airplane as a means of satisfactory and economic transportation. And in that the Show more or less filled its purpose. As one entered Madison Square Garden one was immediately confronted with a display of six great transport planes of the types which are now being used on various American airlines. The six planes were the Fokker F-32, the 5-AT Ford Tri-motor, the Sikorsky S-38, the Curtiss "Condor," the Consolidated "Commodore," and the Savoia-Marchetti S-55. Unfortunately, though, the size of the main arena did not permit a really good display of these giant airliners. Wings overlapped wings, rudders and elevators had to be adjusted to clear parts of other planes, and hulls and fuselages were projecting out so far that visitors were forced to duck when attempting to pass by.



View of the transport exhibit in the arena from the eastern end showing the Fokker F-32 in the foreground and the F-14 suspended above

New York Show

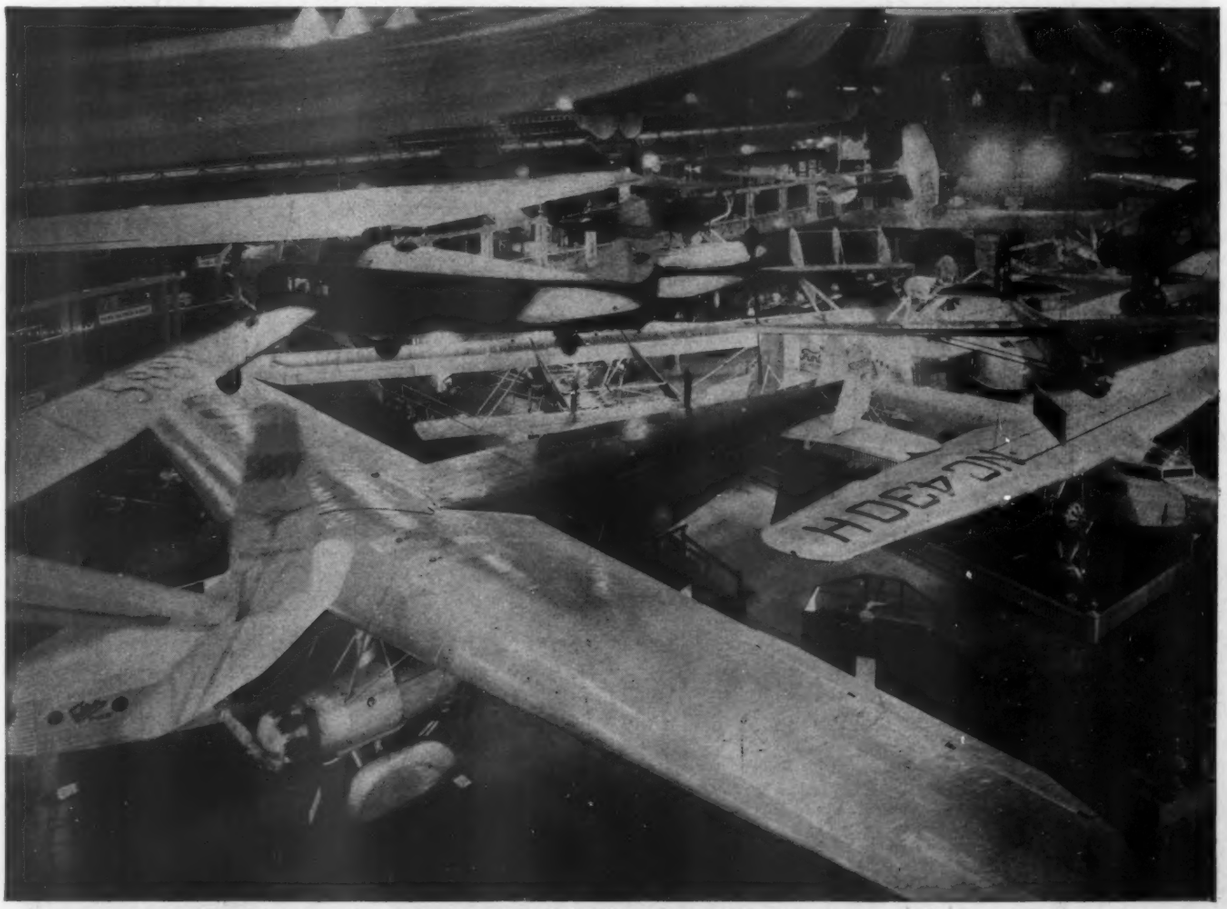
By Leslie E. Neville
Technical Editor of Aviation

Forty-Seven Planes of Which Six Were Large Transports

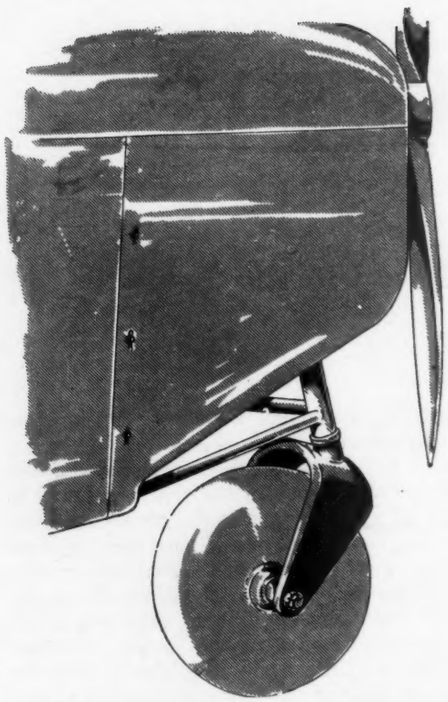
That condition, perhaps the worst of the whole show, existed in both the main arena and the exhibition hall in the basement. In short there were far far too many planes crowded into the show with the result that no plane received the advantages of display to which it was entitled. If future shows are planned for Madison Square Garden it will undoubtedly be borne in mind by the Show Committee that a total of 47 planes, six of which are big transports, is too much wing and fuselage area.

The accessory and power-plant exhibits while surprisingly few when compared with aircraft shows of the past, were well arranged from the standpoint of decoration, but their location in the building can be considerably improved upon in future.

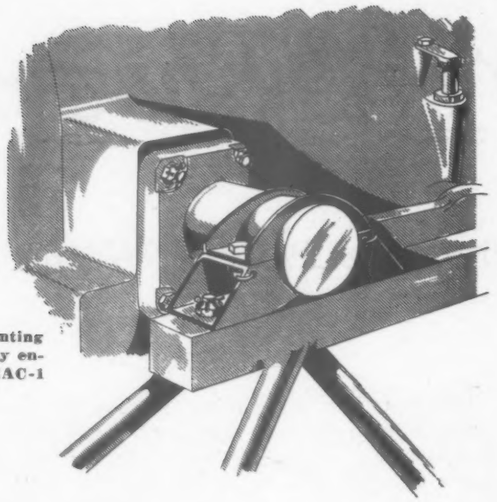
One feature of the Show which was intended to be for the sole benefit of the public, but which resulted in being very much of a nuisance, was the broadcasting of announcements and speeches throughout the building. When one attempted to converse with a friend or business acquaintance he was immediately drowned out by the "blasting" of the radio amplifiers. And when one endeavored to concentrate on what was "coming over the air" the effort was to little avail. Perhaps it was the acoustics of the building or poor articulation, but at any rate it was extremely difficult, and sometimes practically



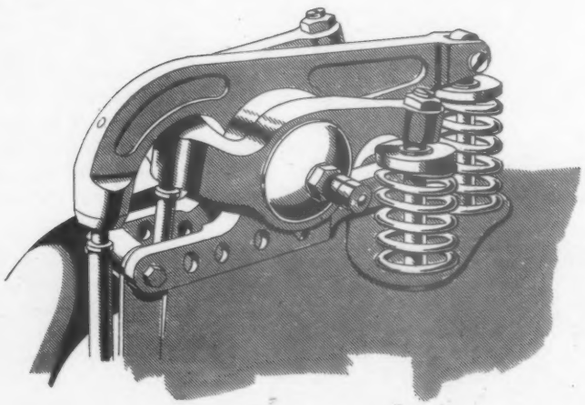
The transport exhibit in the southeast corner showing the Ford club plane at the right and the Savoia Marchetti S-55 directly behind it



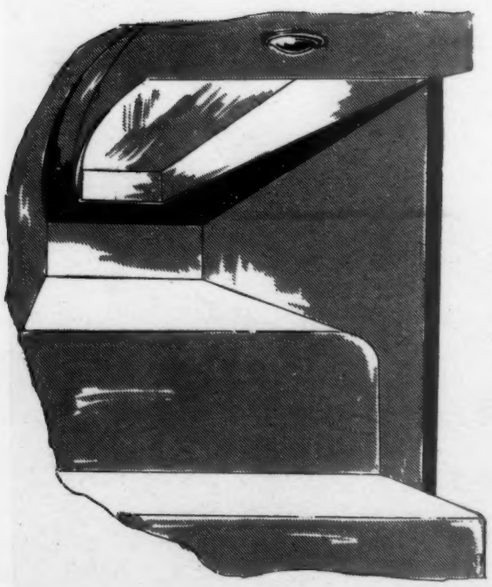
The nose wheel of the Fernie tandem plane



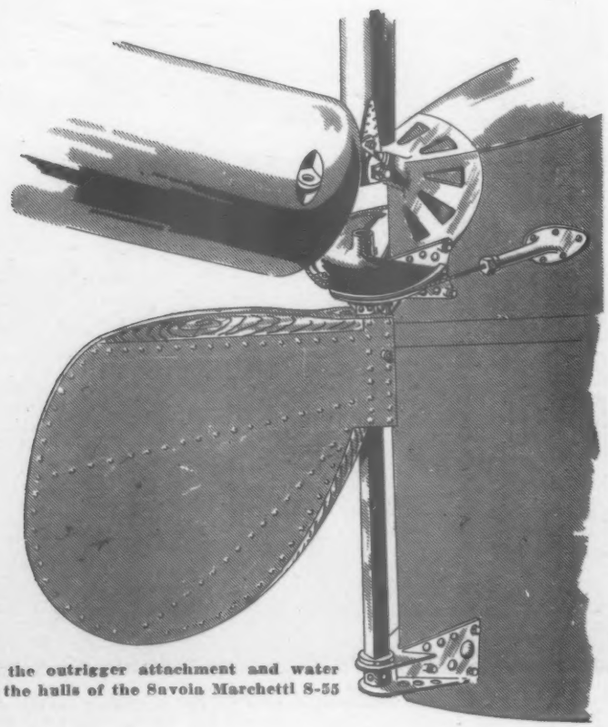
Detail of mounting for Wright Gipsy engine in the EAC-1



Mechanism used to actuate the three valves of the General Air Motors Co. engine



The transparent portion of the Huntington "Governor" wing permits visibility above and behind



Detail sketch of the outrigger attachment and water rudders on one of the hulls of the Savoia Marchetti S-55

impossible to understand the speaker before the "mike."

At the present writing official attendance figures are not available. However, it is believed that total attendance did not establish any records. If that eventually proves to be the case it can be largely attributed to the weather during Show Week. After weeks of unusually raw weather for spring in New York a heat wave suddenly descended upon Manhattan and bathed man, beast, bird and fish in perspiration. A day or two after the arrival of the heat wave the Show opened, and for the rest of the week Madison Square Garden was little short of a Turkish bath. Perhaps that experience will lend strength of argument to those who believe that the New York show should always be held during January or February.

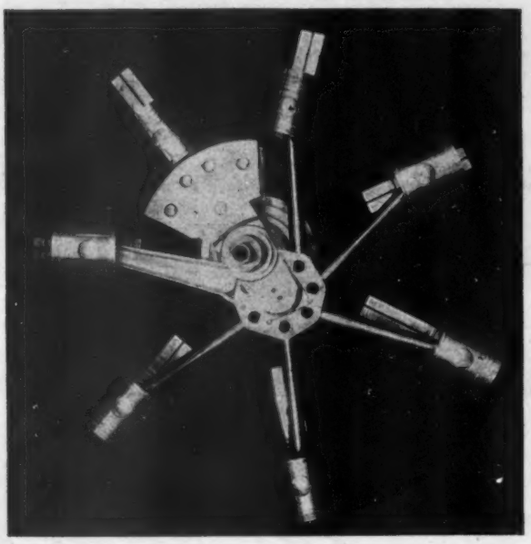
There is considerable difference of opinion regarding the value of the New York affair from the standpoint of sales. In the opinion of some exhibitors the show was a waste of time and money. Yet some others report that they received more good leads at the New York Show than at any other aeronautical function. It should prove interesting to judge the truth of such statements by the number of exhibitors why apply for space at the next New York Show sponsored by the Aeronautical Chamber of Commerce. However, the Chamber has been concentrating on aero merchandising for some time and any sales failure of the New York show should not be laid at its door.

TECHNICAL PROGRESS has not been able to keep up with the rapidly recurring aircraft shows of the year and as a result there was little new to be exhibited.

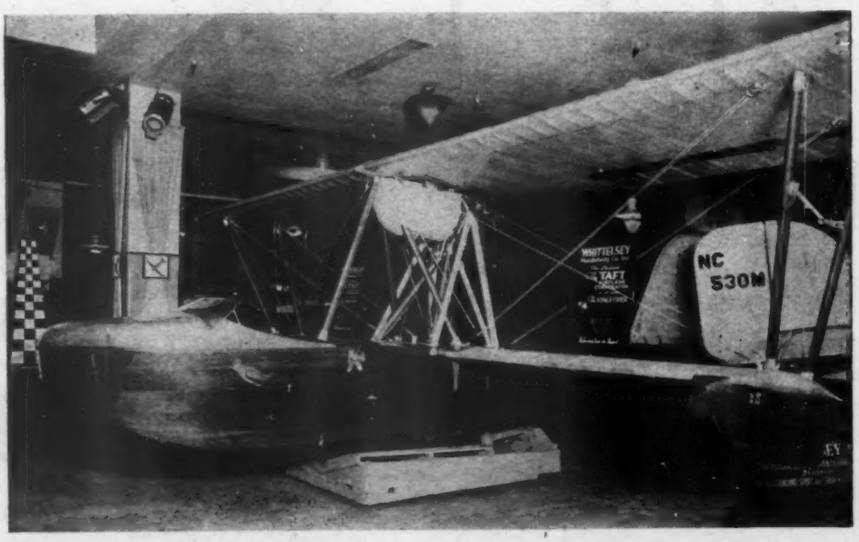
One of the significant features bearing out former predictions was the great proportion of amphibions and flying boats. Of the 47 planes actually exhibited ten were water craft, equally divided as to amphibion or flying boat. The trend toward flying boats has even entered the glider field and was manifested in the form of the Peel Glider Boat. This craft was one of the six engineless machines exhibited and is designed to be towed behind a speed boat to attain flying speed. Of the 47 planes there were 23 monoplanes, an equal number of biplanes and a single sesquiplane. While the large majority were powered with radial engines, there were seven representatives of the in-line type, the Aeronca with its opposed engine and the Curtiss Condor representing the water cooled type.

One of the tendencies that cannot be overlooked is the effect of the low pressure tire on the landing gear design in the light and medium weight plane class. A number of the newer light planes are eliminating the shock absorber entirely where low pressure tires are used, resulting in cleaner landing gears and greater aerodynamic efficiency. However, some structural economy is sacrificed, as in most cases the designing engineers have been faced with the necessity of increasing structural weight slightly to provide sufficient strength for landing stresses for this type of gear. The original and display Packard Diesel engines were shown and a special showing of Packard power plants was staged at the New York showrooms of the Packard Motor Car Co.

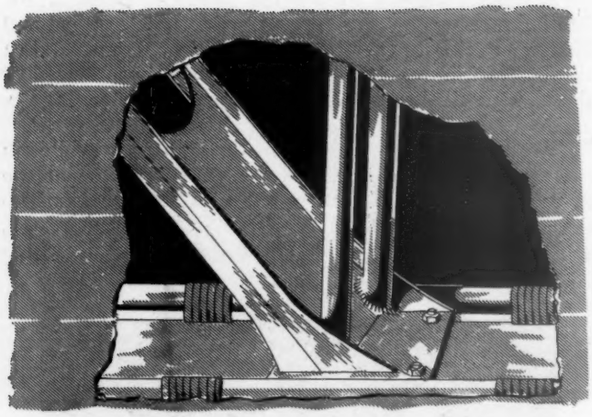
TWO OF THE SIX airplanes in the transport exhibit in the arena were exhibited for the first time at the New York Show. Of these the Consolidated Commodore has been described in detail in the January 11, 1930, issue of AVIATION. The second, which is scheduled for detailed description in the near future, is the American built Savoia-Marchetti S-55. The S-55 is a twin hull tandem engine flying boat of all wood construction, and the machine at the show was powered with two Wright engines, the power plant being located well above the wing. The design embodies the use of a three-spar, cantilever wing and tail surfaces attached to the hulls by



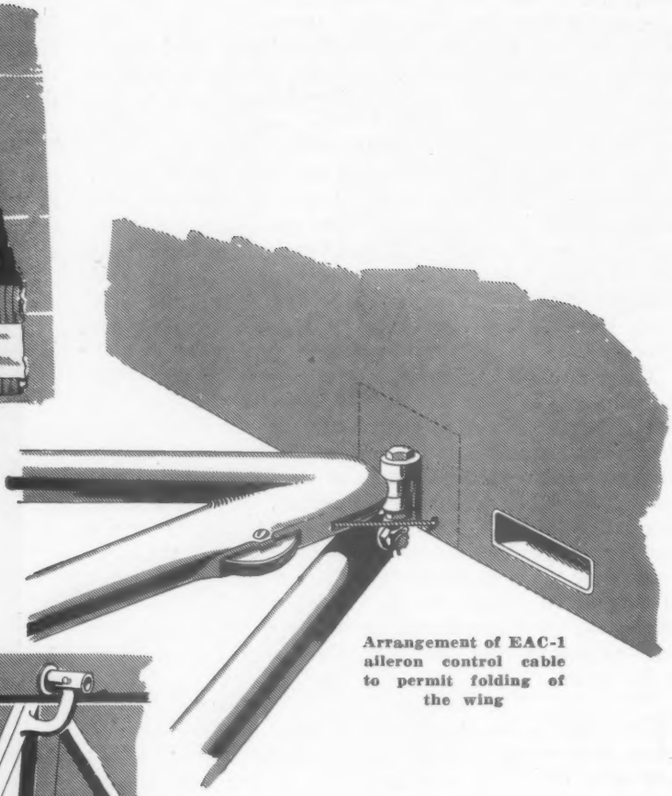
The attractive exhibit of the Comet connecting rod assembly



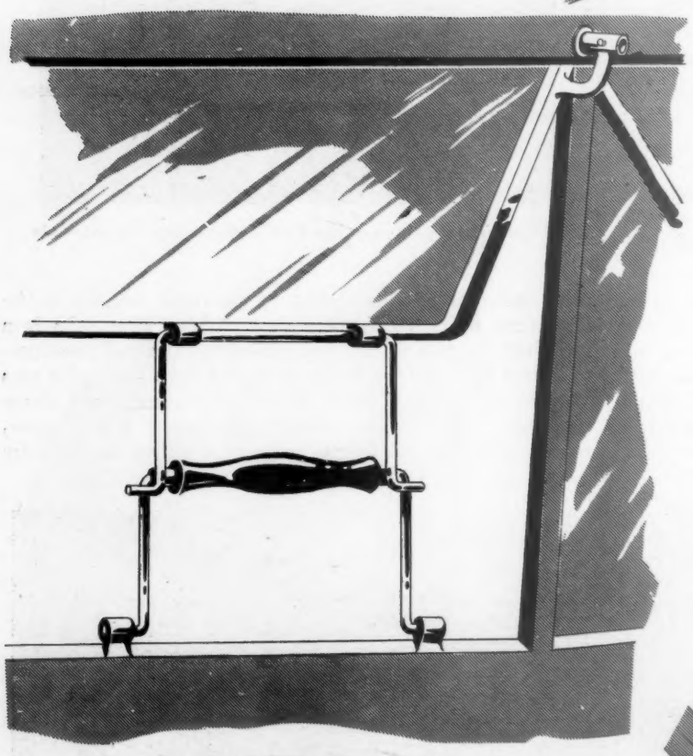
The Taft Kingfisher which is to be produced as an amphibion by the Whittelsey Manufacturing Co.



A portion of the fin structure of the Savola Marchetti S-55

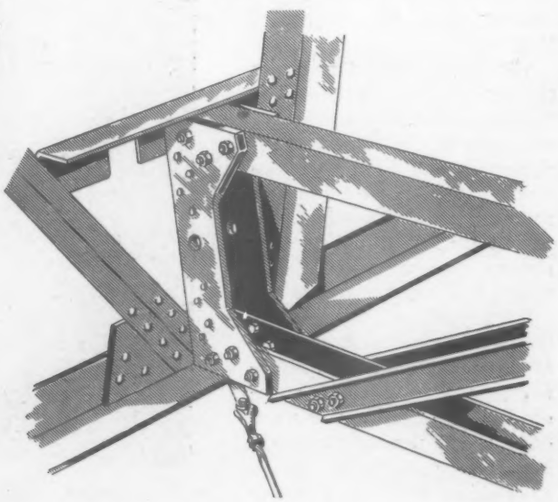


Arrangement of EAC-1 aileron control cable to permit folding of the wing

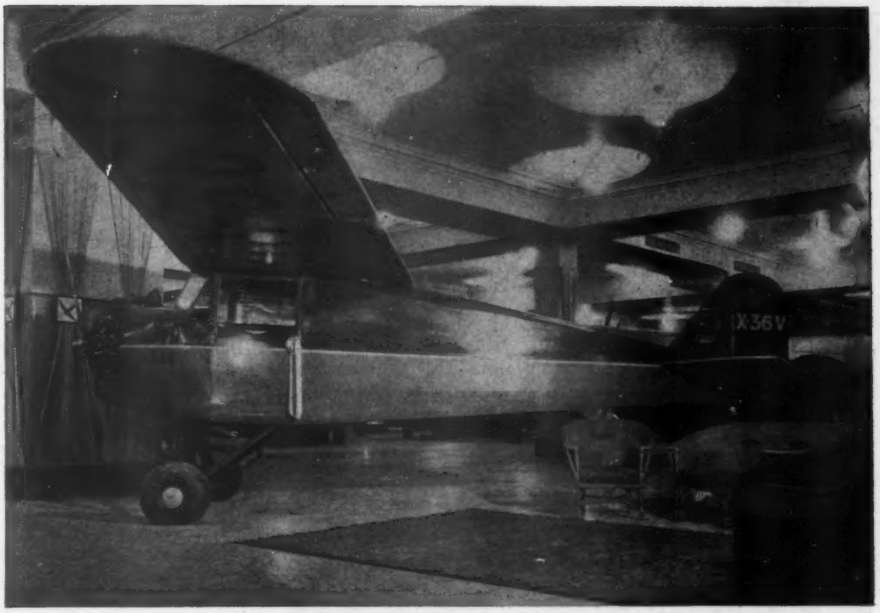


The simple ventilating device on the window of the new Monocoupe

Fuselage construction detail of the New Standard training plane



means of outriggers. The plane has a wing span of 78 ft. 9 in., an overall length of 54 ft. 1½ in. and a wing area of 959.7 ft. The passenger capacity is fourteen and the gross weight, 16,100 lb. A number of refinements over the Italian design have been introduced in the American model, probably the most noteworthy being the installation of entrance doors on the inboard sides of the two hulls so that it is possible to enter from a single float stage located between the hulls. The hatches of the former design are retained for the use of the crew, but the new doors are a great convenience for passengers.



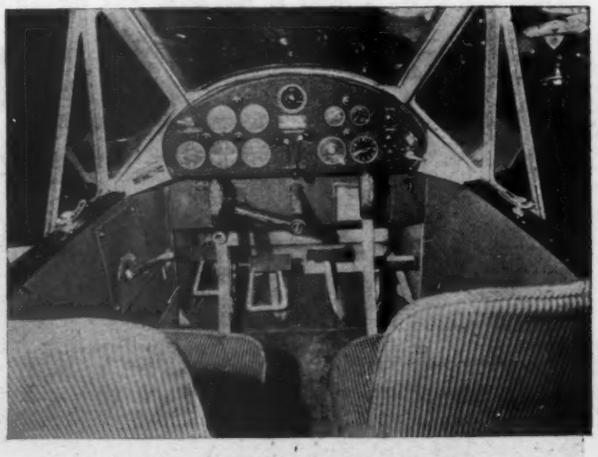
The "Governor"-Ship introduced at the show by the Huntington Aircraft Corporation

For the first time in air show history the Fokker F-32, largest American built land plane, and the Consolidated Commodore, largest American built flying boat, were exhibited under the same roof. This was not done without difficulty from the standpoint of the management and, in order to accomplish it, several portions of the seating space in the arena, as well as the entrance ways, had to be torn out.

Among the lighter planes exhibited on the lower floor of Madison Square Garden there were several new creations, most of which were of conventional design, the exception being the tandem plane displayed by the Fernic Aircraft Corp. This airplane designated the "Cruizaire" has all of the characteristics of its predecessor the T-9, but is considerably smaller, being designed for two passengers, with a gross weight of 1,400 lb. The unusual features about the machine are its tandem wings and its landing gear which embodies the use of a nose wheel rather than a tail wheel. The Fernic might be considered as a conventional low wing monoplane with the addition of an auxiliary wing of smaller dimensions than the main wing, mounted at the extreme nose on a system of cabane struts which raise it above the level of the main wing in flying position, the intention being that the front wing stalls earlier than the main wing. The center of gravity is approximately at the leading edge of the main wing and considerably ahead of the two main landing wheels which have a 7 ft. tread. The effect of this is that the plane is in normal flying position when standing on the ground and in landing. The power plant is the 4-cylinder inverted Rover engine.

Among the more conventional craft in the exhibit were the EAC-1 introduced by the Engineers Aircraft Corp. and the Huntington "Governor" ship, which was shown by the Huntington Aircraft Corp., both of these developments coming from Connecticut. The EAC-1 is a 2-place, externally braced monoplone with side-by-side seating arrangement in an open cockpit and powered by the Wright Gipsy engine. The plane has a span of 30 ft. and a gross weight of 1,400 lb. It is characterized by a sharp sweepback in the wing for purposes of stability and accessibility of cockpit, and is provided with folding wing, permitting storage in a space of 20 ft x 11 ft. The EAC-1 is of conventional construction and embodies a number of ingenious devices intended for comfort, probably the most noteworthy of these being the locking arrangement for the folding wings, which precludes the possibility of taking off with wings unlocked. An unusual feature is that no adjustment is provided in the stabilizer, but a device is included to take the tension off of the control stick or to provide a variable neutral position of the stick fore and aft.

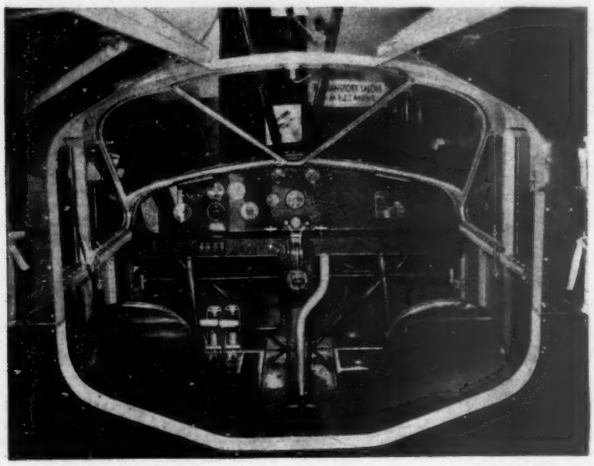
The Huntington "Governor" ship is a cantilever cabin monoplane powered with the Warner Scarab engine and having side by side seating arrangement. Structurally and aerodynamically it is conventional. The span is 35 ft. 5 in., the gross weight 1,650 lb. and the wing loading 9.2 lb. One of the most noteworthy features of the design is the roomy cabin and the similarity to automotive characteristics. The stabilizer adjustment is controlled by a lever that bears a striking resemblance to the automobile emergency break. The doors at either side of the cabin are rectangular in shape and of sufficient



One of the refinements in design was the starting crank in the cockpit of the Bellanca monoplane

area to make entry and egress comparable to the present type of closed automobile. A design feature in this airplane that might well be emulated by other manufacturers of closed monoplanes is the transparent section of the wing behind the seat, making it possible to see above and behind. This feature was also noticed on the American Eagle monoplane exhibited at the show and on one or two others, but it is certainly worth while for designers to remember that a cabin monoplane can not have too much visibility.

The Swallow Airplane Co. introduced its new Axelson powered plane at the show. The new "Swallow Special" is an unequal span biplane, the upper wing being 31 ft. in span and the lower 23 ft. 2 in. The gross weight is 2,200 lb. The plane is a 3-place general purpose machine



Interior showing controls of the Sikorsky S-39. The small wind driven propeller at the top center provides current for the windshield wipers

having the structural characteristics of its predecessors. As in the case of the other new light planes at the show it was equipped with low pressure tires and no additional shock absorbing medium in the landing gear. A number of refinements are embodied in the design, probably the most important of these being the increased baggage compartment space which in the present model is 30 in. x 10 in. x 12 in. and 8 in. x 14 in. x 18 in. and the provision for 75 lb. baggage weight.

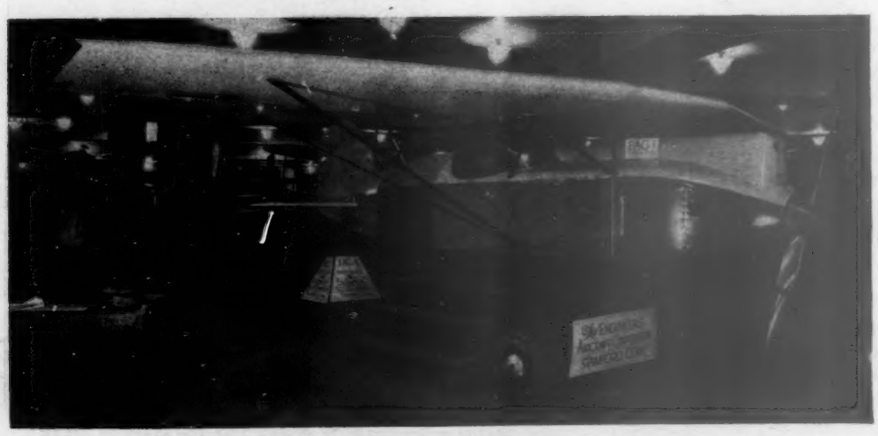
One of the late arrivals at the show was the Taft Kingbird, a flying boat which is to be produced by the Whittelsey Manufacturing Co. which has purchased the capital stock and assets of the Taft Airplane Corp. Although the craft displayed at the show was a flying boat, it is to be produced as an amphibion under the name of Whittelsey amphibion. The machine has a wooden hull, wooden wing structure and fabric wing covering. It is of the pusher type powered with the LeBlond engine. The upper wing span is 37 ft. and the overall length 28 ft. 9 in.

THERE WAS ALSO little new among the engine exhibits at the show. However, there were three new engines that were worthy of mention. Among those introduced were the Isotta Fraschini group, and a great deal of interest was attracted by the 1,800 hp. 18-cylinder broad arrow type. This engine, incidentally, is liquid cooled and was developed by order of the Italian Military Aeronautics, from whom special permit had to be secured in order to display it in this country. This power plant, which was by far the largest in output exhibited at the show, is surprisingly compact. Several other interesting power units of the same make were also on display. The American engines introduced for the first time at the New York Show were the Beetle Model K by the Kimball Aircraft Corp. and "Pirate" by Menasco Motors Inc. The Beetle is a 7-cylinder radial type of conventional construction except for the cylinders which are of the F-head type. The intake valve is located at the rear of the cylinder and the exhaust valve is located in a removable cage at the extremity of the cylinder to facilitate cooling. The intake valve operates by direct contact with the tappet, while the exhaust valve gear embodies a push rod and rocker arm. The engine has a bore of 4.5 in. and a stroke of 5.25 in. and is rated 135 hp. at 1,850 r.p.m. The weight dry is 370 lb.

The Menasco Pirate is a 4-cylinder inverted in-line ain cooled engine rated at 90 hp. at 1,800 r.p.m. and having a weight of 270 lb. The engine is conventional in design and is characterized by its simplicity of mechanism. Four gears provide all camshaft and magneto timing and three of these are of the same dimensions. The bore is 4½ in., the stroke 5⅛ in. and the compression ratio 5.1:1. The length overall is 45½ in., the height overall 28¼ in. and width 12½ in.

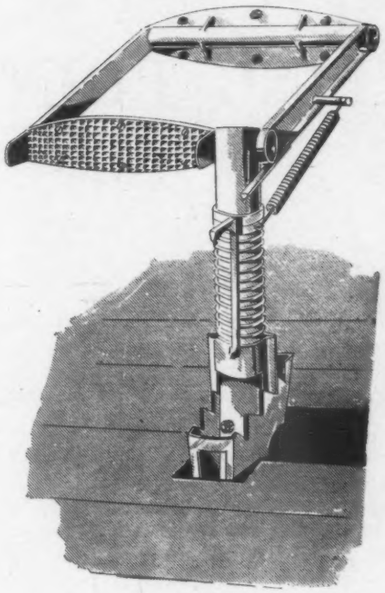
Included in the exhibit of the Curtiss-Wright Co. was the new geared Cyclone engine, which is now being offered for commercial use by the Wright Aeronautical Corp. The engine is rated at 575 hp. Other Curtiss and Wright engines also were shown.

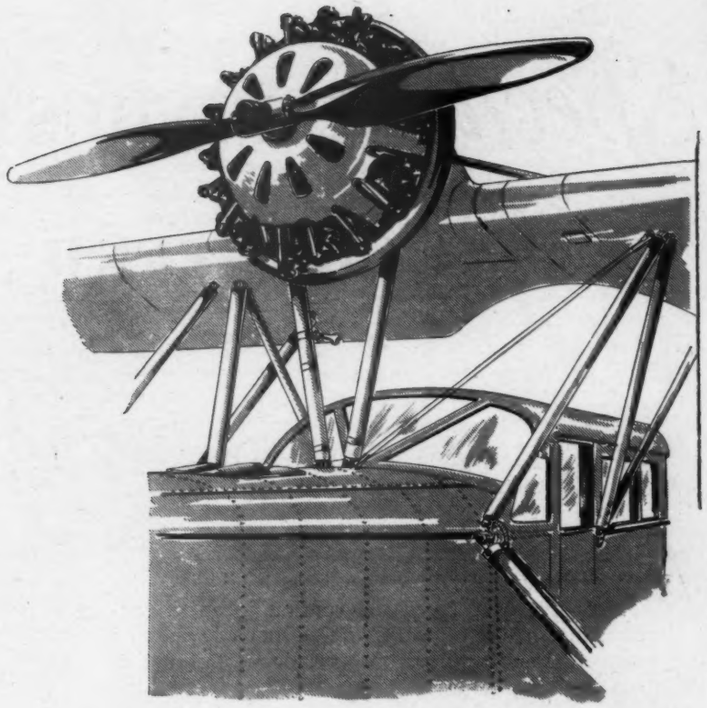
As in the case of the Detroit Show, the exhibits of gliders lead one to believe that this branch of the industry is going to be important in the future. In addition to the Peel Glider boat previously mentioned, engineless craft was shown by Waco, Bowlus, Detroit Aircraft and Franklin, the exhibit of the latter company being an "Eaglet," the type used by Frank Hawks in his towing flight.



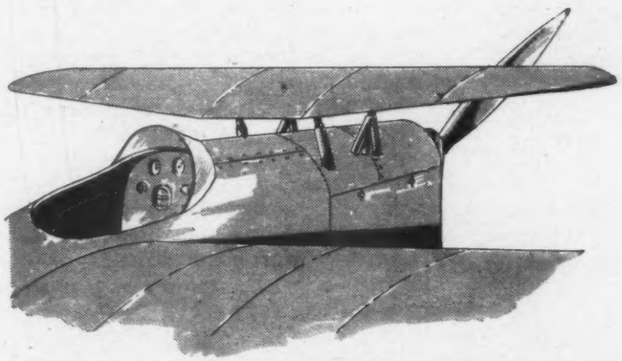
Photograph of the EAC-1 showing the sharp sweepback of the wing

The adjustable rudder pedals of the EAC-1. An upward movement of the toe changes the position of the pedals to one of four adjustments

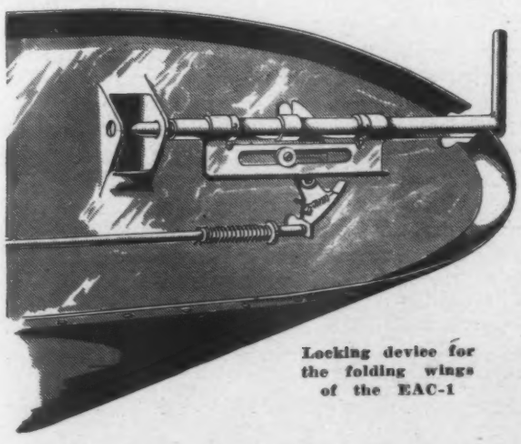




The struts supporting the engine mount of the Sikorsky S-39 have been changed to the position shown in the sketch to reduce interference effect and increase visibility



Attachment of the auxiliary wing of the Fernic tandem plane



Locking device for the folding wings of the EAC-1

The tail wheel of the Sikorsky S-39 which is used without shock absorber as a result of the low pressure tire

Speed, THE INDUSTRY'S GREATEST SELLING POINT

By HENRY O. PATTISON, JR.
Assistant Editor of AVIATION

A WIDE VARIETY of subjects beginning with aircraft engine types and continuing on to general discussions of the industry, offered much of value to the designer, manufacturer, or operator of aircraft at the new York show sessions of the S.A.E. and the A.S.M.E.

The subject of speed seemed to predominate at all meetings. Almost invariably, as each paper was read, mention was made that speed was aviation's greatest asset and must be developed. Types of engines and planes which did not foster and show promise of this development were considered useless. The speed element reached its climax with a paper by Lt. A. J. Williams.

George J. Mead, read the first paper, "In-Line Liquid-Cooled vs. Air-Cooled Engines." He started off with a definite statement that his paper touched only on commercial applications of aircraft engines and did not deal with the military aspect in any manner. He stated that the initial effort in design of an aircraft power plant was to produce an engine light enough to permit flight. We are now faced with a complex maze of types and uses which require very definite study. It was quite natural that much could be learned from the automobile engine.

The first air-cooled engines were of the rotary type, using the rotary motion of the cylinder to cool them. Due to the centrifugal force, it was impossible to build an engine of over 200 hp. The general use of aluminum soon made the liquid-cooled in-line and Vee type engine practical. The Germans made several of this type during 1914. It was not long before it was discovered that a steel jacket could be put into a cast aluminum cylinder and this further reduced the weight of an engine and made higher power more practical. The necessity for greater power forced the reduction of weight, so that by 1929 the Vee type of engine, water-cooled, was practically standard.

Starting with 1920, commercial operators evidenced a need for greater reduction in power plant weight, as well as increased dependability. Before this the British had started development of six air-cooled radial engines. During the last four or five years, this type of engine has been almost the standard power plant for our commercial flying. It is interesting to note that power plants of this type with approximately 600 hp. are now being built with a weight of 1½ lb. per horsepower.

One of the main points made by Mr. Mead was that in no instance has a new type of power plant ever been accepted unless its weight per horsepower bettered or at least equalled that of its predecessors. While the weight per horsepower has been reduced, greater dependability has also been achieved.

The first and prime requisite for aircraft engines is dependability. Next to this, comes minimum weight per horsepower.

Speed is one of the principal advantages of aviation. It is, therefore, natural to expect strenuous competition between the various passenger lines in this regard. Thirty per cent of the available power is now used to overcome resistance which could be eliminated. At the present time, a 600-hp. engine should give a speed that is now only possible with 800 hp. Large power plants for big planes will be common in the future. It must be remembered, however, that power plants must be of the right size and numbered for each plane so that there may be a reserve supply, and that the plane may operate on 75% of the total power when cruising or in the event of failure of any of its engines.

Gearing will become common in order that the propeller speed may be reduced, and the consequent noise and passenger discomfort eliminated.

The weight per horsepower of the air-cooled radial engine and the Vee type water-cooled engine, without a cooling system, are practically the same when engines of equal power are considered. The water-cooled engine adds 0.6 pound per horsepower for its water and radiator. The latest development to reduce this weight has been the use of ethylene glycol in place of water. However, when such a system is used it is no longer possible to cool the oil and it is therefore necessary to add an oil radiator. This adds drag and also weight.

It may be possible to reduce power plant drag to such an extent that a liquid-cooled engine of greater weight will more than compensate for this by making available a greater percentage of its power for the propulsion of the plane. At present, an air-cooled engine with a proper cowling gives no greater drag than the water-cooled type of engine. Much development may be expected in the reduction of drag in radiators. Mr. Mead thought it quite unfair to compare the fuel consumption of a Diesel cycle engine, operating in a compression ratio of 14 to 1 with a present-day engine of the Otto cycle running at 5½ to 1. There is much room for improvement, and the greater compression ratio a great saving in fuel consumption should be shown.

In concluding, Mr. Mead stated that it is impossible

Discussed by the S. A. E. and the A. S. M. E. at New York, along with Engines, Amphibions and other matters

G. M. Bellanca, whose paper on amphibion design and transportation was read

at present to predict which type of engine would be favored for the larger power units.

Captain Brewer of Langley Field, led the discussion with a statement that drags might be so lowered that weight may be increased. He has high hopes for an engine which could be placed in the wing. Dr. Sanford A. Moss discussed superchargers in connection with engines. He stated that at the present time, a Diesel may be supercharged to deliver 40 per cent extra power, while a gain of 25 per cent is considered good with the Otto type.

There was much discussion on the two cycle engines. Many seem to think that it offered a great future, and a Junkers engine, developed in Germany, was offered as an example. It seemed the opinion of the majority present that there was a great deal to be learned by research along these lines.

Mr. Biddlecombe, of New York University, stated that reliability is too often forgotten. Liquid-cooled engines will stand more punishment from bad fuel than will air-cooled radial engines. As an interesting side-light on the paper, it was brought out that ethylene glycol has approximately the same flash point as gasoline.

THE SECOND PAPER of Tuesday morning was read by Mr. W. F. Davis and was entitled "In-Line Versus Radial Aircraft Engines." Mr. Davis started his paper by lamenting the number of engines which have been produced in this country without proper engineering development. The personnel, capital, and time required for the development of aircraft engines is very hard to procure. He thought that it was very well that the 1929 deflation in the aircraft business had temporarily stopped the mad race to place in production anything and everything in the way of an aircraft engine that would fulfill the minimum requirements of the Department of Commerce. He thought that this had given the industry time for consideration of the pros and cons of various types of engines.

The main thing that aviation has to sell is speed. All other things are secondary, but not overwhelmingly so. Safety is paramount, and this depends almost entirely upon engine reliability. Excusing himself from any discussion of the Diesel type of engine, Mr. Davis continued with his subject. While reliability is the first consideration in the selection of an engine, it can only be proven by many service tests. Performances of aircraft engines to date have not been adequate for the establishment of public faith in aviation which is essential to the proper growth of the industry. It is proper therefore to deduce that present-day designs are inadequate.

The inverted in-line air-cooled engines present features which cannot be duplicated in the radial type engine. The main feature is the ease of lubrication. It is much easier to make an in-line type of engine more rugged than a radial. Mr. Davis was also of the opinion that the in-line engine presents a simpler design and hence a more reliable type due to its overhead valve pipe which eliminated the articulated rod design of the radial. The expansion of an exhaust valve on an overhead cam shaft arrangement aids rather than abets the engine's operation. A compensated radial valve gear tends to correct this condition, but does so at the cost of complications and reduction of reliability.

The simplicity of air-cooling commends itself for reliability regardless of the type of engine. The size of a satisfactory air-cooled cylinder is definitely limited by the cylinder-cooling capacity. For reliability's sake, therefore, it is well to employ as a maximum cylinder size one well within the limits of satisfactory cooling. Power may then be increased by increasing the number of cylinders. On a radial engine the number of cylinders is limited by the push rod assembly. Mr. Davis thought, however, that it was not impossible that six, twelve, or even twenty-four cylinder in-line engines might be developed. It is possible to adequately cool any number of cylinders of an in-line arrangement.

The radial engine can be made lighter in weight for a given cylinder displacement. However, the limitations placed on its permissible maximum speed due to the load of the heavy rotating connection rod assembly and the high inertia of the push rod type valve gear make it easily possible for the in-line engine to equal or better the specific weight per horsepower by increased output and a high speed with no sacrifice of reliability. This is due to the low crankshaft and bearing load in the in-line type of engine.

The in-line, inverted engine with completely inclosed valve gear is a much cleaner and quieter engine than any other so far developed. Improved visibility is an obvious feature of the inverted in-line engine. It also permits a lower landing gear. It costs somewhat less to produce radial engines than in-line engines. This loss, however, would be completely offset in quantity production by experience gained from the automobile manufacturers.

It costs slightly more to mount an in-line engine than a radial. There is very little difference, however, between the total cost of the installation of both engines when they are completely cowled.

Mr. Davis was of the opinion that, as to service costs, the life of the high-grade in-line engine would greatly

surpass that of the radial. The in-line would go much longer between periods of overhaul than the radial. He was quite convinced that the in-line type of engine offered a solution for many of the present problems of the radial engine.

The discussion on this paper centered mostly around the frontal area and resistance of radial and in-line engines. Captain Brewer, of Langley Field, brought out the major point when he echoed the feelings that were evident at Detroit and plead for more co-operation between designers and engine builders to the extent that drag might be eliminated and interference greatly cut down. He stated that at present an engine is designed to have a very low frontal area and little drag, and in mounting the engine in a plane so much interference is created by struts and other members that the entire benefit of the engine design is lost.

Mr. Allison, of the Navy Department, was of the opinion that the drag of a radial engine could be reduced to the equal of an in-line engine by good cowling.

Col. V. E. Clark, who was to have presided over the afternoon session, was unavoidably delayed and his place was ably filled by Mr. C. H. Biddlecombe of New York University.

Lieut. C. H. Schildhauer, who spoke on the Dornier Do-X

The first paper of Tuesday afternoon was "Amphibion Design and Transportation," by G. M. Bellanca. Due to Mr. Bellanca's absence this paper was read by Mr. R. M. Mock. The author prefaced his paper with a short history of amphibion development.

He stated that the public has long desired amphibion planes. It is easy to ascertain the demand of the public, but it is not so easy to satisfy this demand. Unfortunately, he believed, we do not as yet know how to make craft that will completely satisfy the demands of the public. The worst difficulties to overcome in the design of an aircraft are weight and resistance. This difficulty exists more in seaplanes than landplanes, and still more in amphibions. He cited as an illustration of this point the Bellanca Pacemaker, showing how it might be efficient as a land plane, losing some of its efficiency when made into a seaplane, and becoming almost impractical when made into an amphibion.

A hasty investigation made by Mr. Bellanca of the weight percentage of the landing gear in a seaplane or a flying boat showed it to vary from 5 to 7 per cent of the gross weight, or almost 30 per cent of the pay load. In the case of an exposed landing gear he found that the speed was reduced approximately 6 per cent. In the face of such difficulties it is not surprising that the development of amphibions has been slow.

Mr. Bellanca was very emphatic in his statement that an amphibion today which was successful could not be merely a matter of fine design. Any plane designed to land on water has a large percentage of its power absorbed in resistance alone. Added to this the weight of such a hull or float makes the problem extremely difficult. He was equally emphatic in his statement that in the face of all these difficulties the amphibions which are now on the market are remarkable examples of good design. They must, however, be improved.

Amphibion transportation has advantages which cannot be over estimated. It makes possible, on many occasions, the saving of large amounts of time such as are now occupied in going to and from airports at the larger cities. To offset this, however, there is the fact that amphibions at the present time are slower than landplanes.

Concluding the paper, Mr. Bellanca made it clear that the amphibion must carry a sufficient pay load and be endowed with sufficient performance to compete with other types of aircraft. His closing sentence was "Proper design is essential."

Discussion on this paper started off with a statement that amphibion use in the United States is more limited than it first seems. While many claim that the planes are safer because of the frequent bodies of water, it is in reality very difficult to land them except in a very wide stream and where there is little, if any, current. In addition, their price is very high.

It was the general consensus of opinion that amphibions were useful and would always find a market with small private owners.

Someone from Fokker company stated that they had had much trouble in getting the brakes on amphibion planes to function properly. It was thought that the Sikorsky company had eliminated this difficulty with a brake of its own design.

When all advantages and disadvantages of both types were aired, the final consensus of opinion seemed to favor the hull rather than the pontoon type of amphibion, that is, the conversion of a flying boat rather than a seaplane into an amphibion.

THE SECOND PAPER of the afternoon was read by Mr. J. C. Hunsaker of the Goodyear Zeppelin Corporation and was entitled "Transoceanic Air Travel." The first point brought out by this paper was that the records so far of transatlantic flying have not been of great help as far as statistical conclusions are considered. All of these flights have been made with overloaded planes and without payloads.

An airplane can fly the Atlantic, providing it has all the elements, both mechanical and physical, in its favor. A large enough flying boat might be able to make a forced landing and ride out reasonably high seas. In general, however, a forced landing on the high seas cannot be tolerated by commercial enterprise.

Larger airplanes are being built, but their endurance unfortunately is not increasing. The spectre of engine failure is serious for a dynamically supported aircraft. Multi-engined airplanes reduce this danger somewhat, but multiply the chance of engine failure. Mr. Hunsaker seemed very definite in his point that there is little safety to gain from multiple power plants. Airplane or flying boat as known and built today cannot be made safe enough for transoceanic air travel.

The large airships, on the other hand, are ideally adapted for such work. Repairs may be made in the air and the failure of any of its power plants does not bring disaster. He cited as an example, the Zeppelin flights across the Atlantic as having been successful, except one, where a forced landing was necessary. In this case he made a point of the fact that with four out of five engines dead one engine brought the ship safely in.

The freedom of an airship for dependence on any single piece of its structure or machinery is in direct

contrast to the airplane and therein lies the big advantage of an airship. On the ground, however, the airship is only safe when securely moored or housed. Here the airship is very weak compared with an airplane. He compared the airships with great ocean liners, which are safe enough at sea but can only enter several ports of the world, even then they are in danger of grounding, and at great expense from pier charges and tugs.

All of these points were directed toward proving that airplanes and airships are not competitive, each having its individual field.

Airships are relatively inefficient in smaller sizes; hence the commercial airships will always be large units with an extremely large initial cost.

His next points in the paper were the comparison for distance and weather conditions of all the transatlantic routes. Mr. Hunsaker stated that even though artificial islands were anchored across the Atlantic their expense would be too great for practical operation. Air liners of the future must be able to fly on regular schedules over regular routes and take the weather as it comes, be it good or bad. In this connection the Zeppelin has a decided advantage since it may ride out a storm or, due to its high speed, may maneuver to avoid it entirely.

Whereas the airplane, once started, must continue on to its destination without delay, the airship may delay its time of arrival indefinitely to suit the weather conditions.

J. C. Hunsaker discussed lighter than air transportation

At the conclusion of this paper Major Biddlecombe introduced Col. James Fitzmaurice, who started the discussion. His main point was that, if the airships did heave to without pushing through the storm, its speed is lowered, and speed is the only factor which the aircraft industry has to sell at present. Comfort and other things cannot be offered to the extent that they may be found in other transportation media. The discussion on this paper was short and everyone seemed well satisfied with its presentation. Mr. Hunsaker presented approximately a dozen lantern slides to illustrate his weather maps and the accommodation and engine mounting details of the new Goodyear Zeppelins.

WEDNESDAY MORNING was given over to the discussion and the reading of papers on two very interesting aircraft. The first of these was entitled "Do-X Flying Ship" and was written by Dr. Claude Dornier of Germany. The paper was presented to the meeting by Lt. C. H. Schildhauer of the Dornier Company of America. So much has already been written on the Do-X that it is unnecessary to entirely abstract this paper here. A description of the plane was published in the January 4, 1930, issue of AVIATION.

There was no discussion on Dr. Dornier's paper but it was followed by a ten-minute reel of pictures showing the giant ship in construction and during its test flight.

One interesting feature which has not previously been covered was the chart prepared by Dr. Dornier showing routes over which the Do-X would be practical, and giving the number of passengers which might be carried. Much interest was manifested in the cost of operation of a plane of this size. Dr. Dornier's paper showed that it operated at a cost of from $5.78 to $6.94 per mile, according to the distance flown.

In concluding his paper, Dr. Dornier gave out a few general statements of the aviation industry. He did not think that the industry was as far advanced as is generally thought. He thought that it is greatly hurt by the pessimistic people who say that those who build planes of the Do-X type are in advance of their times and are impracticable. The Doctor said that he is positive that the demand for flying exists.

Lieut. A. J. Williams who discussed speed flying

THE SECOND PAPER of the morning was "The Autogiro" and was delivered by W. Lawrence Le Page, of the Kellett Aircraft Corporation.

This paper opened with a brief review of the history of the Autogiro. The experimental work began in 1919 and involved a number of unsuccessful arrangements of the rotating blade system including attempts to create a symmetrical lift system by means of two separate rotors revolving in opposite directions. It was not until a single wind mill of four blades was evolved having the blades hinged freely to the hub, that flight was successful.

Mr. Le Page pointed out the fact that there were no fundamentally new aerodynamic principles involved in the design of the autogiro, there being merely a new application of these principles. Because the details of the theory of autorotation are more or less complex, Mr. Le Page confined his discussion to the simpler aspects of the mathematical relations involved, but went to sufficient length to show clearly the mathematical bases for the rotational and lifting effects of the wind mill system.

The theoretical conditions centering around a wind mill system in rotation only are considerably more complicated by the introduction of a motion of translation of the entire system. The satisfactory solution of this aspect of the problem was pointed out to be the outstanding characteristic of the investigation of the autogiro.

The paper then discussed the effects of the hinging of the blades into the rotor hub. The blades are hinged horizontally and are restricted when at rest by the action of a system of rubber cords which prevent them from striking the ground or other parts of the machine. When in rotation centrifugal force maintains them in the flying position and the load is entirely removed from the supporting cords. It is stated that in an autogiro of above 2,000 lb. weight the centrifugal force on each blade would be in the neighborhood of 5,000 lb. at 150 r.p.m., making the inertia forces in each blade about ten times the lift forces.

The stresses in the blades are therefore of a considerably different nature from those encountered in an ordinary airplane wing. On some of the newer models of autogiro the wings have been hinged in a vertical direction to permit a small amount of relative motion between them and to relieve the blade hubs of unbalanced

drag forces which change periodically in the course of the cycle. Inter-blade bracing has been introduced to take care of the unbalanced forces.

After leaving the discussion of the rotating system Mr. Le Page described the auxiliary parts of the autogiro which are very similar to corresponding parts of the conventional airplane. It was pointed out that, contrary to airplane requirements, a tail surface producing lift is required to offset the positive moment which tends to make the machine tail heavy in flight because, due to the high mounting of the rotor, the point of intersection of the lift vector and the center line of the craft moves forward of the center of gravity as the speed increases. The reasons for the use of the short wing were discussed and also several of the usual characteristics such as inclination of the thrust line, etc.

IN THE AFTERNOON came two general papers, the first of which was "Speed Flying" by Lieut. Alford J. Williams, Jr. In his paper Lieutenant Williams repeatedly stressed the fact that commercial aviation must speed up if it to get anywhere. At the present time it is far too slow to compete with well organized railroads.

One of the major points brought out by Lieutenant Williams was that it is impossible to predict what speed will be reached by airplanes. Each time a new record has been established everyone has said that it approached the ultimate limit, but it is always increased soon after.

Lieutenant Williams paraphrased much of his racing experience for the benefit of those at the session and told of many humorous incidents as a result of his racing experience. He concluded his paper by laying great emphasis on the fact that the younger generation is growing up to accept aviation as a matter of course and high speed as commonplace. It was this fact, he held, that dispelled much of the cynicism so often found.

THE closing paper of the S.A.E. session was delivered by Major Leslie MacDill of the Army Air Corps and was entitled "Some Aspects of Commercial Aviation from the Viewpoint of an Army Officer." The paper touched in general on all phases of commercial aviation and dwelled in particular on the point of adapting commercial enterprise and industries to needs of the country in time of war.

Major MacDill made several vital points during his paper. One of these was the fact that the total profit on all government contracts could amount to no more than $1,000,000 per year as the present budget stands. This $1,000,000 must be divided among all countries holding government contracts, hence it is easy to see the approximate amount of profit and earnings to be made by these companies.

No figures were available, he said, to indicate the total amount which might be earned by commercial aviation, but it was not greatly in excess of the amount of government contracts. Thus, he said, it was easy to see that with all the companies which are now manufacturing planes and accessories, the earnings per company would be very small.

One of the major points of this paper was the decrying of the fact that large banking interests had entered aviation. Unless a company shows a substantial return on the money invested bankers are not willing to foster it. Commercial aviation cannot at present show these earnings and must be largely a matter of future earnings.

It is always possible to have a three-engine transport plane more reliable than a single engine plane, but Major MacDill did not believe that the American public will pay for the added cost necessitated. He was quite firm on the point that the single engine transport would be the plane of the future.

In a discussion on this paper the main point brought out was that Americans are reluctant to accept foreign ideas. On the other hand, foreigners readily accept any innovation that we develop. Mr. W. F. Allen of the General Electric Co. said that he did not believe that the Europeans could produce better engines and planes than we could, but that he believed they would do it sooner because of this course.

WEDNESDAY EVENING the Metropolitan Section of the S.A.E. held its annual dinner at the Park Central Hotel. At this time a paper "Transportation Versus Air Circus" was read by Mr. F. B. Rentschler, President of the Aeronautical Chamber of Commerce of America. The paper was presented in a good manner and was very well received.

THREE PAPERS were presented at the sessions held by the A.S.M.E. on Thursday. The most extensive of these was that by C. H. Biddlecombe entitled "Service for Airplane Engines." This paper gave quite a detailed report on the different service plans employed by the various engine manufacturers. Mr. Biddlecombe presented in great detail the trends of industry along this line and the present-day systems as employed by the larger engine manufacturers. It was his opinion that unless the engine manufacturers of the country continued to give the service which they do now, or for that matter, better service, the growth of the industry will be considerably hampered.

Another paper, "Engine Problems in Aircraft Servicing," by George Drysdale of Brooklyn, New York, went into the engineering side as encountered by the service man in aviation. The paper's main points and details seemed to be a plea for more co-operation between the engineering departments of the airplane manufacturers and the servicing departments. By proper co-ordination of design the service may be greatly aided and the costs much lowered.

Mr. Drysdale believed that airplane manufacturers would find it expedient to adopt the policy found in the automotive industry of a first-cost repair schedule.

The third paper on the subject of aircraft servicing looked at it from the point of view of the owner. In his paper, "Airplane Servicing from the Operators' Point of View," Richard C. Marshall of the Thompson Aeronautical Corporation said that the growth of aircraft servicing had been more or less without control. At the present time there is absolutely no standardization in this servicing, and many opportunities are lost for economy.

The smaller repair depots and individual operators cannot effect the economies that a large repair shop with a constant stream of business can. For this reason Mr. Marshall believed that the large deposits will be the thing in the future. He cited as an example the Thompson Aeronautical Corporation's activities, showing how they have consolidated their work and employed the best type of workman to effect economy.

Mr. Marshall then went into much detail as to the individual operations of repair, showing how in every instance they had attempted and usually succeeded in improving the processes actually employed by the manufacturers.

CREATIVE *Wing Design*

The Possibilities of a System for Coordinating Design Procedure

By RALPH H. UPSON

THIS INVITATION from Mr. Warner to expand further some of the material from my recent S.A.E. paper ["Wings—A Co-ordinated System of Basic Design," S.A.E. Journal, January, 1929] sufficiently indicates the interest in the subject. Yet I had hoped that further contributions would be from others, because the principal object of the paper referred to was not to set up any one rigid system of design but to show by practical example the possibilities and importance of *some* system for co-ordinating and focusing design procedure. There is probably no serious lack of system in the ordinary routine of checking and revising a set of preconceived ideas; but there is a comparatively neglected field for system in the creative part of the design,—for picking the ideas themselves. And here perhaps the most fundamental need is an adequate system for establishing the best general proportions and arrangement of wings.

The main trouble seems to be due to a kind of hang-over of bad habits from the pre-Prandtl era, though I doubt if there is any competent aeronautic engineer today who doesn't use the principle of induced drag.

Now what are some of these lingering, though obsolete, habits that don't jibe with the new principles? First, is the method of picking an airfoil, from the many hundreds available, by direct comparison of their wind tunnel characteristics. Apparently the old idea was that some day all these scattered results could be brought together into a monumental volume, something like a mail order catalog, where each little airfoil would be illustrated and its particular merits set forth. We might imagine a similar collection of tests on the weight, strength, and deformation of model wing *structures* presenting more or less haphazard differences in size, shape, arrangement, materials, and scale effect, the latter mostly unknown. Indirectly, such a book would be very instructive; but its use for direct design purposes would be justifiable only in a rather primitive, cave-man state of the art.

CONTINUING the analogy of the static wing structure, a logical design will proceed directly from a consideration of the *forces* that have to be carried, with due regard for the limitations of space, materials, etc. The same applies to the aerodynamic aspect of wing design. In fact the most distinguishing mark of *modern airfoil design* is its emphasis on the forces themselves and their direct interreactions rather than on the so-called "airfoil characteristics."

And here we are almost on the point of tripping over another bad habit, inherited from the old school, that of dealing with the airfoil as something more or less distinct from the wing structure. Someone will probably rise to protest that requisite spar depth and spacing is alluded to in all the time-honored text books. Quite true,—but mere allusion is not enough for a relationship so close that for certain purposes it almost obliterates the identity of the parts. If it weren't for the structural requirements there would *be* no aerodynamic problem, because the principal sign posts of efficiency would all point in the same direction. Similarly if it weren't for the aerodynamic requirements there would be no structural problem. In other words, the two problems are combined into one in the preliminary or creative design. And if this part of the design is wrong, the design as a whole is wrong, and little or nothing can be done later to "fix" it.

In recognition of the above relationship, the following semi-empirical equation for "structural airfoils," gives the direct relation between the aerodynamic forces and

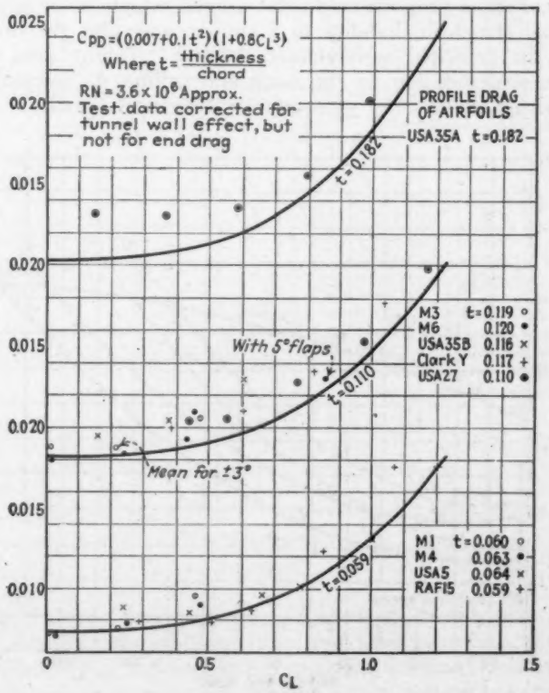


Fig. 1

the structural proportions, without reference to the "airfoil section" as ordinarily used;

$$C_D = \frac{C_L^2(1+\delta)}{\pi \quad n} + (0.007 + 0.1t^2)\ (1 + 0.8\ C_L^3)$$

where n is the aspect ratio (span/mean chord)
t is the thickness ratio (thickness/chord)
$(1 + \delta)$ = plan form factor (usually 1.02 to 1.06)
C_D and C_L are drag and lift co-efficients (N.A.C.A. absolute).

THE FIRST TERM above is of course the induced drag and the second the profile drag. The latter is for a Reynolds number of about 3,500,000, and is adjusted to give the thicker sections an estimated drag value corresponding to faired tips. Fig. 1 shows its relation to a series of tests on actual airfoils with squared tips.

Several other airfoil formulas have recently been suggested,—one of them, derived from tests in the Variable Density Tunnel, being superficially similar. But all of them, as far as I know, try to do too much by including the effect of detail section changes, which have no direct connection with the structural problem, and therefore have no place in the basic formula. The median camber, for example, is only a direct means to an end,—that of utilizing the aerodynamic properties inherent in the basic proportions,—an end which should be already known from a consideration of the approximate plan form and operating range of lift co-efficient. In the same way the detail arrangement of internal structural parts is a means to an end,—an end which the competent engineer knows in advance from the general external proportions alone. To properly include such incidentals in a single basic formula is quite impossible.

As a matter of fact the formula just given is single only insofar as it relates to the aerodynamic attributes of those basic wing proportions which have both a structural and aerodynamic significance. To complete even the preliminary picture, we must work back through these same proportions to the weight, which is the principal structural liability in a similar way that the drag is the principal aerodynamic liability. Taking part of the structure out of the wing and calling it "parasite" doesn't change this principle of structural liability, but only complicates it by putting part of it to one side as a drag effect.

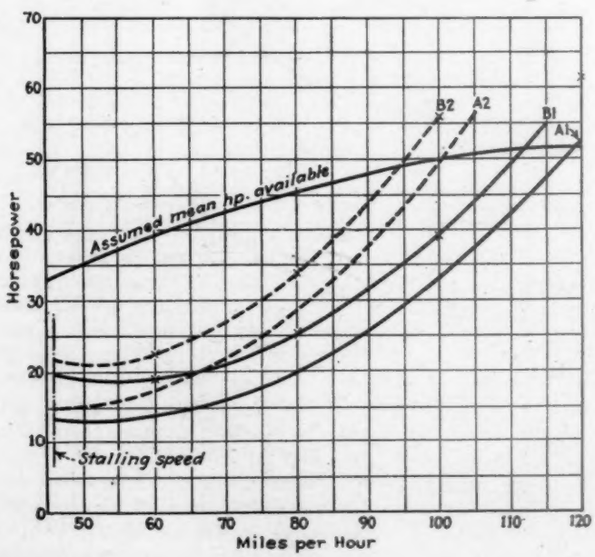


Fig. 2

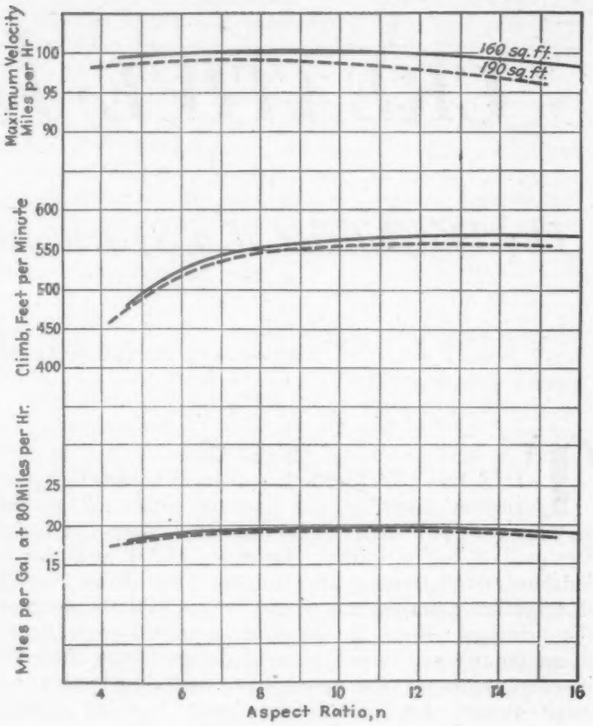


Fig. 3

And then we soon find that besides these back door and side door connections between weight and drag, there is the still more important front door connection. For, although the drag has little or no direct effect on weight, the weight has a noticeable effect on drag, especially at low speeds; and both are, of course, factors in various important performance characteristics. These fundamental quantities, even for wing design purposes alone, must hence be expressed as properties of the entire airplane, with allowance for interference and other secondary, though important, effects.

The usual method of achieving this necessary co-ordination consists of testing in the wind-tunnel a model of more or less preconceived proportions, for which the weight effects are independently estimated and utilized, together with the wind-tunnel data, in computing the full scale results. Such a method, intelligently followed, is of value at least in a negative way. It is a good check against the possibility that interference will seriously increase the drag or injure the stability and control, usually in a static sense. It would also be a direct means of forecasting performance if it weren't for the discrepancies introduced by scale effect, slip-stream and small parasite parts. A man of wide experience, particularly in the use of some one tunnel and subsequent flight tests, will often be able to make surprisingly accurate corrections for these descrepancies, especially when they tend to counteract each other. But the corrections are arithmetically of a similar range of magnitude to the test results themselves; and the same experience, further co-ordinated, should be capable of forecasting the final results without the continued aid of the wind tunnel, *except* in the matter of interference and special cases of turbulent flow. Thus the wind tunnel, though sometimes an important accessory, is now *only* an accessory; and should never

be regarded as the central sun around which practical design procedure revolves.

Scientific research in aerodynamics is of course very much dependent on the wind tunnel or its equivalent. But its value depends on being able to test a whole series or family of related models; and even here the ordinary atmospheric tunnel has apparently passed its peak of greatest usefulness. It is not only that the wind tunnel is limited to the aerodynamic side of the problem, but by its very nature it focuses attention on preconceived arrangements and proportions which may be all wrong,—and more than likely *are* all wrong unless the design has already been established by a more fundamental and direct method.

SUCH A METHOD must involve a co-ordination of weight and drag for the complete airplane in terms of the various basic proportions, and in a form convenient for manipulation. As here presented, it takes the form of two equations, one for weight and the other for drag. The latter is developed primarily from the airfoil equation already given but is modified to include the tail surfaces, interference effects, etc. The weight equation simply shows the direct practical effect of changes in proportion on the structure of small and medium sized planes. For both weight and drag, the classification of component items is not primarily with respect to the specific part of the plane involved, but rather with respect to the manner in which the different items vary. The equations follow; in a form to include the actual numerical coefficients as used *in this particular study:*

Summary of variables (all dimensions in feet)

b = overall span
c = root chord (at root of cantilever)
a = root thickness (at root of cantilever)
$(a-.2)$ = effective structural thickness
$t=\frac{a}{c}$ = thickness ratio, assumed constant for any one plane
y = distance of lateral center of area from root $= .2(b-2)$ for 4 : 1 taper or $.125(b-2)$ for rectangular wings braced half way out
S = net planform wing area
S_1 = same plus area cut off by fuselage $= S + 2c$
S_c = cantilever area $= S$ for cantilever wings or $\frac{1}{2}\ S$ for externally braced wings
n = aspect ratio $= \frac{b^2}{S_1}$

Gross Weight $W = W_1 + W_2 + W_3 + W_4 + W_5 + W_6 + W_7$

$$1000 + W_2 + 0.8S + \frac{0.24S_cb_y}{S(a-0.2)} + \frac{1.2S_cS_1t}{S} + \frac{S_1^2}{b^2} + 0.0$$

where: W_1 is the "fixed load," comprising all that is not a direct function of the wing proportions
W_2 is the weight of outside wing struts, zero for "cantilever" wings or 60 lb. (estimated) for the externally braced examples
W_3 is the covering (here plywood) of wings and tail surfaces, and surface stiffeners
W_4 comprises main spar flanges and fittings
W_5 comprises spar webs (plywood) and reinforcing blocks
W_6 comprises rib webs or lattices
W_7 is the wing torque bracing ("drag bracing"), here assumed carried by the plywood skin

Total drag at 100 m.p.h.,

$$D = D_1 + D_2 + D_3 + D_4 + D_5 + D_6 + D_7$$
$$= D_1 + D_2 + 0.22S + 3.3t^2 + 0.0 + \frac{0.014W^2}{b^2} + 0.00004(D_3 + D_4)\frac{W^3}{SS_1^2}$$

where: D_1 is that part of the direct parasite drag which is unaffected by changes in the wings, tail surfaces or their external structure; includes direct interference
D_2 is the drag of the external wing and tail bracing, zero for cantilever or 16 lb. (estimated) for the externally braced examples
D_3 is the skin friction portion of the profile drag, including tail
D_4 is the added profile drag due to thickness ratio
D_5 is the added parasite drag (due to true angle of attack) here assumed zero
D_6 is the induced drag, including induced interference, the latter taken at the minimum of 12 per cent.
D_7 is the added profile drag, due to true angle of attack as measured by the lift coefficient

The drag for speeds other than 100 m.p.h. is obtained by simple proportion. The first four terms vary as V^2; D_5 is contant throughout the speed range; D_6 varies inversely as V^2; D_7 varies inversely as V^4. Three or

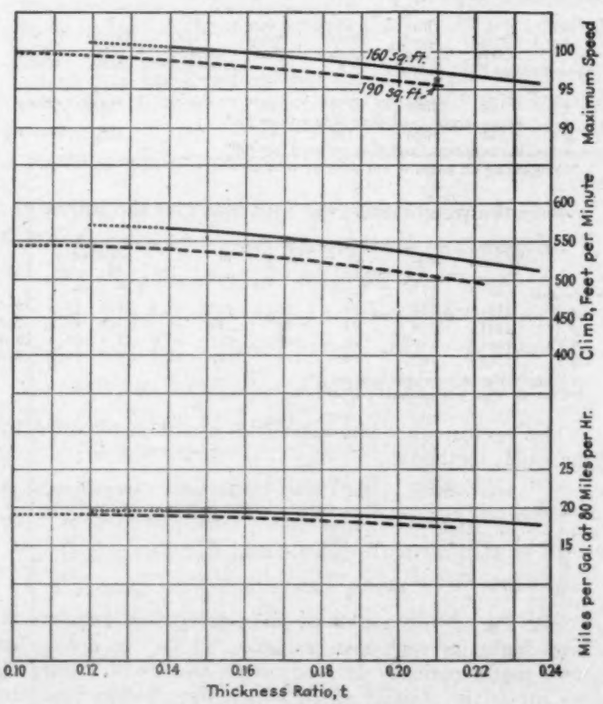


Fig. 4

four different speeds, properly chosen, are usually enough to establish the required drag and power curves. The coefficients in the weight equation will of course change with different types of structure and materials. For other than the assumed conditions, the drag equation

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coefficients are also subject to variation, particularly with interference effects; (see original paper).

As will have been noted, these equations, although long, are of very elementary construction. The principal difficulty in their use is in the employment of proper judgment for the evaluation of doubtful coefficients. A reasonable error in this respect, although affecting the new performance figures, will not usually much affect the choice of proportions to get the *best results*. In the latter respect particularly, the general method offers a logical foundation on which to *base* judgment; and is at least another step toward eliminating the national amateur contest to see who can guess the best airplane.

In the original paper, the relative effect of different wing combinations and proportions was shown by evaluating the weight and drag equations for a series of different taper ratios, aspect ratios, areas, etc. Here we shall first pick out two of the best combinations for light low-wing monoplanes, using the above equations to establish the weight and drag figures which in turn will be used for the calculation of actual performance characteristics. These will be compared with the corresponding characteristics of two hypothetical guess-work planes. All I can say for the latter is that they are my own guess as to what *might be* a fairly intelligent guess of the desired wing proportions. They are certainly not unreasonable, judging from actual planes that have recently appeared. All four planes are assumed with the same engine and total "fixed load," the latter comprising the useful load, power-plant and most of the fuselage and landing gear. The wing area and the type of wing structure will also be the same for all cases. The main characteristics are as follows:

Example	S Wing Area (Sq.Ft.)	W_1 Fixed Load (Lbs.) *	D_1 Fixed Drag *	b Span (Ft.)	Taper Ratio $\left(\frac{\text{root chord}}{\text{tip chord}}\right)$	t Thickness Ratio	Wing Struts
A 2	160	1000	125	40	4:1	14.3%	None
A 1	Same except fixed drag reduced one half.						
B 2	160	1000	125	30	1:1	12%	Top only
B 1	Same except fixed drag reduced one half.						

*Comprising all parasite not directly related to the wings (lb. at 100 m. p. h.

Then the weight and drag formulas give the following:

	Gross Weight	Total Drag (Lb. at) 100 (mi. hr.)	80 (mi. hr.)	60 (mi. hr.)	50 (mi.hr.)	Corresponding level thrust required at 100	80	60	50
Example	W	D							
A 2*	1281	186	134	108	113	49.6	28.6	17.3	15.1
A 1**	1281	124	93	86	97	33.1	19.8	13.7	12.9
B 2	1265	210	159	140	157	56.0	33.9	22.4	20.9
B 1	1265	147	119	118	141	39.2	25.4	18.9	18.8

*Case *C* (Fig. 4 in original paper).
**Case *D* (Fig. 4 in original paper).

The performance characteristics are then obtained by the usual methods:

Example	Max. Surplus t.h.p.	Max. Climb (ft. p. min.)	Max. Speed (mi. p. hr.)	Approximate mi. pr. gal. at 80 mi. p. h.
A 2	22	560	100	20
A 1	27	690	119	26
B 2	17	430	94	17
B 1	22	560	112	22

See Fig. 2 for a plot of the horsepower required in level flight for each assumed case. It may be noted that these mathematically derived curves have to be arbitrarily cut off at the stalling speed which, for preliminary purposes, is simply approximated from the wing loading. It is the same in principle as the limitation of Euler's equation in strut design, but less restrictive because practically all performance characteristics except landing speed and control characteristics beyond the stall are, with the proper profile, represented by points well away from the burble region. To be strictly accurate the horsepower-available curve should be separately plotted for each case, but for simplicity a single representative curve is here used. It results in slightly undervaluing the differences in top speed and overvaluing the difference in climb. The vertical component of the propeller thrust is disregarded in all cases.

IN THE PROVINCE of wing design alone the principal comparison is between *A*2 and *B*2, and between *A*1 and *B*1. As might be generally expected, the wing design is more important at low speeds and the reduction of the fixed drag or parasite is more important at high speeds. It will be seen from the table that, in spite of its greater thickness and weight, *A*2 climbs approximately as well as *B*1 though the latter has only half the fixed drag. Example *A* will have generally better control than *B*, especially in respect to stalls and spins.

It should be noted that no additional interference drag is assumed for *B*, except as included quite nominally in the estimate of the wing strut drag (totalling 16 lb. at 100 m.p.h.). Any material increase of interference due to faulty general proportions could also be charged to the wing design, and as shown in the original paper may in certain cases amount to at least half of our total assumed difference in fixed drag. Interference of the "spoiler" type, not here considered, may also be a factor, particularly in further reducing the climb of the poorer designs and in complicating the control.

In Fig. 3 is shown the effect of varying the aspect ratio for cantilever wings, tapered 4:1, with effective structural wing depth kept proportional to span. Fig. 4 shows the effect of thickness ratio alone for a constant span of 40 ft. Each is figured for a wing area of 190 sq.ft., as well as 160 sq.ft., the performance characteristics being plotted directly against the chosen wing variables. In all of these examples, $W_1 = 1{,}000$ lb., $D_1 = 125$ lb. (at 100 mi. hr.) and the power-plant is the same as before; in other words the results show the effect of variation in the wing proportions alone. Although Fig. 3 is plotted conventionally on a basis of aspect ratio, it should be noted that this is a proper source of comparison only for constant fixed load and area. In the same way, conclusions from Fig. 4 based on variation of thickness ratio must be limited to the weight, area and plan-form under consideration.

The assumption that the torque loads are carried by the skin is probably not entirely justifiable for the extreme left-hand (dotted) portions of these curves.

The most general conclusion to be derived from Figures 3 and 4 seems to be that a single item like aspect ratio or thickness ratio, in spite of its basic character, is still a single item among many details entering into the design of the airplane, any one of which may vary throughout a considerable range without *seriously* injuring the performance, providing other proportions and details are laid out to correspond. But the cumulative effect of mistakes running through a whole department of design is quite a different matter.

There is no need to dwell upon the importance of detail aerodynamics for producing a safe and "clean" design, or upon the importance of structural efficiency in detail. These may now be taken for granted. What I do hope to have emphasized, in proper proportion, is the importance of basic coordination *between* the aerodynamic and structural aspects in creative design. As the figures clearly show, such coordination in the aggregate may easily make all the difference between a superior design and one which is "just another airplane."

Lighting LOS ANGELES AIRPORTS

By CHARLES F. MCREYNOLDS
Pacific Coast Editor of AVIATION

The new terminal station at the Grand Central Air Terminal, Glendale, Calif.

NECESSITY is also the mother of progress if the night lighting of Los Angeles airports may be cited as an example. Some of the finest night lighting equipment in the United States has recently been installed on various airports in or close to Los Angeles city, not through any civic pride but because airline operators found it necessary to include a number of night landings in their schedules, and the Department of Commerce will not permit transport planes to land on unlighted airports. There are now four transport companies operating seven planes daily either in to or out of Los Angeles after dark. From 50 to 100 people deplane in Los Angeles each evening from transport planes which took off during daylight but must land on artificially lighted fields. This practice is rapidly converting people to night flying and hastening the time when perhaps a majority of our long distance traveling will be done by night planes which will move us from city to city without the loss of any part of the business day.

There are now ten airports either lighted or in the process of being lighted within an 18-mile radius from the Los Angeles city hall. Seven of these ten airports will come within a ten mile radius of the downtown district, three will have an "A" rating on lighting, of which two, Los Angeles Airport and Grand Central Air Terminal have completed the lighting installations, while the third, the new United Airport, is now installing complete lighting equipment. The Los Angeles Airport, formerly known as Mines Field, scene of the 1928 National Air Races, was the first airport on the Pacific Coast to be granted an "A" rating on lighting. There are seven lighted fields now in use: Los Angeles Airport, Grand Central Air Terminal, Glendale; Clover Field, Santa Monica; Long Beach Municipal Airport, Long Beach; Western Air Express Terminal, Alhambra; East Side Airport, Montebello; and the Los Angeles Metropolitan Airport, Van Nuys. The three fields now being lighted: United Airport, the Continental Air Express terminal, and Standard Air Lines terminal; are all within the city limits of Los Angeles.

Two lighted airways serve Los Angeles at the present time. These are the Seattle-Los Angeles route, and the Salt Lake City-Los Angeles route, over both of which mail is regularly flown at night. Two other routes are to be lighted in the near future; the Los Angeles-Kansas City, and the Los Angeles-San Diego lines, both of which are used exclusively for passenger and freight carrying. Five airports are now equipped with beacons,

Airport lighting presents a problem that can not be solved overnight. Equipment that may fill the needs on one port may fall far short on another. Cost is another item that demands serious thought. In addition there are the likes and dislikes of the pilots to be considered. After all, it is for the benefit of pilots that airports are lighted. ¶*A rather splendid example of airport lighting development is to be found at the various ports now serving the Los Angeles, Calif., area. In this article, Mr. McReynolds relates of some of the problems encountered and describes in detail the equipment installed in that increasingly air-minded section of the United States.*

in addition to the Lindbergh Beacon on top of the City Hall tower. Lights at Grand Central Air Terminal, Los Angeles Metropolitan Airport, Clover Field, and Long Beach Municipal Airport are of the revolving type, while the beacon at the Los Angeles Airport is a 360 deg. flashing type which flashes L.A. in the International Morse Code.

CLOVER FIELD, Santa Monica, with a single runway 900x2,200 ft. in the direction of an almost unfailing west wind, is equipped with but one bank of four Crouse-Hinds floodlights located on the southeast corner of the field, and so directed as to illuminate the entire landing area. This installation has proved popular with pilots because all landings are made over the bank of lights and there is no glare. Night scenic flights are being regularly conducted from Clover Field by Golden State Airways, operating a Ford transport monoplane.

The East Side Airport, located seven miles east of Los Angeles on Whittier Blvd., is a two runway field owned and operated by Roy Patton and Avery Black. Two runways, each 600x2,000 ft., extend in N.E.-S.W., and N.W.-S.E. directions, and are satisfactorily lighted for night flying by two Crouse-Hinds floodlights. Field obstruction and runway marking lights are also provided.

With two intersecting runways, each 1,000x4,000 ft. and extending approximately north and south, and east and west, the Los Angeles Metropolitan Airport has conducted night flying with the aid of a single 180 deg. B.B.T. floodlight mounted at the southeast corner of the runway intersection. The floodlight is directed across either runway as the wind dictates, and landings are made alongside the light. Since the runways are perfectly smooth, this illumination has been found very satisfactory, although additional lighting is planned as night traffic increases. Revolving beacon, ceiling light, runway markers and obstruction lights are also installed.

The Long Beach Municipal Airport, with a single east-west runway in use at the present time and a prevailing west wind, was the first airport in the Los Angeles metropolitan area to be properly lighted for night operations. This field has been equipped for more than a year with revolving beacon, obstruction lights, runway markers, and field floodlights and has lately been equipped with a gas flame ground beacon outlining the letters L.B. at the west end of the runway. These letters serve to identify the field and have proved extremely easy to pick out from among other ground lights because of the flickering yellow gas flames.

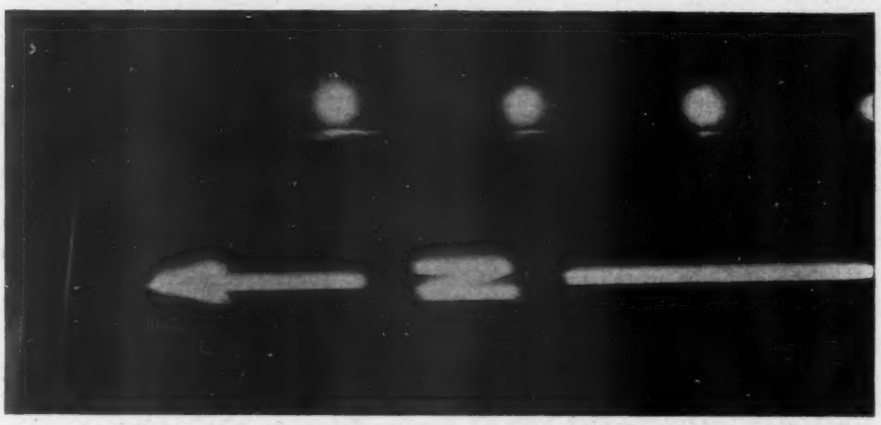
Because of night operations over three different routes converging at the Western Air Express terminal, officials of the company found it necessary to make an installation of lighting equipment which will be greatly amplified as the airport is further developed. Approximately $11,000 has been expended on lighting to date, with installation by the Newberry Electric Co. under the supervision of Thomas E. Nikirk, chief electrical engineer for Western Air Express. The W.A.E. field at Alhambra will eventually include surfaced runways in three directions, but due to the presence of a southwest wind for more than 90 per cent of the time, this runway has been the first to be completely surfaced and lighted. Equipment now in use includes white boundary lights and green runway lights around the 500x2,700 ft. runway, with red obstruction lights on all power line poles. A single 50,000,000 cp. arc light floods the field from the head of the runway so that all planes land over the light source. Passenger planes now arrive regularly at this field after dark from San Francisco, Salt Lake City, Kansas City, and San Diego, while the Los Angeles-Salt Lake mail plane takes off each evening at 7:00 p.m. on the night schedule. In addition to these scheduled operations night scenic flights are conducted each evening and have proved extremely popular.

A tip-over approach light on the Grand Central Air Terminal

Lighting of the Los Angeles Airport was completed in August to give this field the first "A" rating on the Pacific Coast for lighting. With a square mile of available landing area, the field will eventually be provided with five surfaced runways, but since the prevailing wind is westerly the only runway yet surfaced and floodlighted is the east-west runway on the south side of the field nearest the administration building and hangars. Red obstruction lights are mounted on every power line pole

Showing the distribution of light on the main runway at the Los Angeles airport

or obstruction within a seven to one gliding ratio of the field in any direction. The landing area is completely outlined by white boundary lights with green marker lights at each end of the runway in use. Seven Crouse Hinds floodlights mounted in a single bank located just west of the administration building, at about the center and on the south side of the runway in use, give excellent illumination for all night operations. The administration tower is surmounted by a powerful flashing beacon, while the upper portion of the tower, beneath the beacon is lighted on all sides by vertical red neon tubes. On the roof of the two main hangars there are red neon signs, one an arrow pointing north with the letter N in the center of the arrow, and the other outlining the letters L.A. as a further identification of the field. All buildings on the field are completely lighted on all sides and top during the hours of darkness. Lighting equipment was installed by the Los Angeles City Bureau of Power and Light, under the direction of C. N. McKinstry, and no effort was spared to make every part of the installation permanent in character. A Crouse Hinds ceiling light is included in the field's lighting equipment and special attention has been given to the lighting of hangar interiors so that, by the use of wide angle reflectors in overhead lights, shadows have been almost completely eliminated around the planes.



One of the Neon outlined arrows at the Los Angeles airport. This arrow is on the roof of the main hangar and indicates north.

WHEN OFFICIALS of the Grand Central Air Terminal found it necessary to install night lighting equipment they called in the various local illumination experts, asked advice from Department of Commerce Inspectors, and obtained suggestions from pilots using the field in order to be sure that the resulting system would be the most complete which could be laid out. Conditions at the Grand Central Air Terminal presented a number of real problems to adequate lighting. The field has two runways running almost at right angles to each other, and the wind shifts so that it was necessary to provide for landings in either direction on either runway. In addition to this the field is located closer to the downtown district than any other Los Angeles airport, and is consequently bordered by lighted streets and business districts which make it doubly important that the field runways be amply illuminated in order that the pilot may easily distinguish his landing area from the maze of surrounding lights.

After considering bids from various companies, the lighting contract was signed with the Crouse-Hinds Company, of Syracuse, N. Y., and all the work of designing the complete electrical installation was turned over to Horace White, local Crouse-Hinds manager and illuminating engineer. With the exception of the switchboard and control panel in the tower control room, which was of Westinghouse manufacture, all equipment was furnished by the Crouse-Hinds Co., with actual installation work by the Stolper Electric Co., of Burbank, Calif.

The field is marked by a 24 in. revolving beacon mounted on top of the depot tower 61 ft. above the field level. This beacon is of 7,000,000 cp. furnished by an incandescent lamp equipped with a spare light which is automatically switched into place if one light burns out. Beneath the beacon are located two green course lights, one on each side of the beacon on a north and south line and each flashing in the International Morse Code the letters G.C. (Grand Central), just after the beacon, rotating at 6 r.p.m., passes the course light.

Night wind direction is furnished by three illuminated wind cones and one T. The cones are yellow mounted above black circles, two being located on the hangars and one at the west end of the auxiliary runway. The "T" is mounted on a pole at the head of the main runway and resembles a monoplane with a wingspread of approximately 20 ft. Green lights in the form of a "T" serve to indicate the wind direction.

Boundary lights are installed on a series loop extending around the field with lights not more than 250 ft. apart. These boundary lights are located just inside the fence and with the lamp at the same elevation as the fence top. An IL transformer is carried in the cast concrete box at the base of each light, and is provided with a series film cutout socket so that if any light fails the circuit shorts across and continues unbroken. Current is carried to boundary lights by No. 8 single conductor 2,500 volt non-inductive cable buried in the ground. All boundary lights are white with frosted globes.

Green approach lights are placed, three at each end of the main runway, and two at each end of the auxiliary runway. These are of the tip-over type in order to minimize damage if struck by a plane.

Red obstruction lights are placed on the roofs of hangars, and all buildings on the field, on all poles adjacent to the field, and on every object within a seven to one gliding angle of the landing area.

All airport buildings are floodlighted to give at least two and a half foot candles of illumination over all portions of sides and roof, and wherever roof markings are used the illumination is increased to 15 ft. candles. Ordinary white light is used on all buildings except the depot, which is illuminated through amber lenses. There are 60 500 watt lamps used to light the depot, while 30 1,500 watt units and 16 500 watt units are used on the hangar roofs. These are mounted on simple angle iron standards carrying either one, two or four 1,500 watt units, and one 500 watt unit, according to the location on the roof. Side lighting is supplied by a total

of 189 200 watt angle reflector units mounted on 15 ft. centers along the edge of the roof and six feet out from the building side wall.

A 14 in. ceiling projector searchlight is mounted on the hangar roof 500 ft. south of the depot control tower, the light beam being elevated at an angle of 63 degrees 26 minutes to the horizon. A ceiling height indicator calibrated in feet is mounted on the parapet of the depot tower, just outside of the control room, and it is only necessary for the operator to switch on the light and step to the indicator to read directly the height of the ceiling.

FOUR BANKS of floodlights are so placed that it is possible to land in either direction on either runway and always land over and away from the source of light. Although but .15 ft. candles of light are required over the landing surface this intensity is far exceeded everywhere as an added safety factor in the operation of transport planes at night. A total of 19 3,000 watt 32 volt type DCB-24 Crouse-Hinds flood lights equipped with 24 in. precision mirrors are used in the four banks. Six lamps are used on bank No. One at the north end of the main runway, five lights are used in bank No. Two, located south of the grandstand and near the intersection of the two runways in a position to help light the main runway for north to south operations or the auxiliary runway for east to west landings. Six projectors are used in bank No. Three and two in bank No. Four, located respectively at the east and west ends of the auxiliary runway. Bank No. Three serves to light the main runway for south to north operations and to assist in lighting the cross runway for east to west landings, while the fourth bank of lights serves to illuminate the auxiliary runway for west to east landings but can be used for increasing the illumination across the main runway if this should be desired. Thus it is possible to use three of the four banks and 17 of the 19 individual light projectors in lighting the main runway for its normal use in north to south take offs and landings.

Sixteen of the floodlights are equipped with 40 deg. spread lenses, and the other three, located at the runway intersection, with 80 deg. spread lenses. Uneven and "patchy" lighting of the runways is eliminated by locating the lights in banks and so directing each beam that there is a 50 per cent overlap with the next beam. These beams are focused so that all direct light is confined to within seven feet above the runway and practically no spill light is cast above that height.

In addition to the field floodlights there are three auxiliary flood lights mounted on top of the grandstand just south of the depot in order to light the stands and the area directly in front of them for night shows and programs which are regularly staged. Taxiing before and after landing is facilitated by three right angle apron lights in front of the main depot, one of 1,500 watt capacity and two 1,000 watt lights. These serve to illuminate the loading and unloading platforms and after a plane has landed by means of the field floodlights the latter are cut out and the apron lights switched on, making it much easier to taxi up for enplaning or deplaning of passengers.

Electric current for the lighting system is supplied and controlled independently of any other electric installation on the field. A main vault, of concrete construction and almost completely underground, is located just north of the depot and control tower. Into this vault is directed the power line of 2,300 volts and from it 64 control wires lead out to a small desk control panel in the control room of the field tower. This control panel was designed by Horace White, the engineer in charge of developing the lighting system, and was constructed by the Westinghouse company. There are 12 circuits embracing every phase of the night lighting installation, which are remotely controlled from the desk panel in the glass enclosed control room. Pilot lights opposite each switch on the control panel are an added guarantee of positive control of any portion of the system.

From the main vault individual 2300 volt power loops lead out to each light bank vault, where the current is fed into one main transformer and reduced to 110-220 volt which is fed individually to each lamp through a 220—32 volt transmitter. In addition to the remote control panel in the control room each of the twelve circuits may be controlled through main switches in the main power vault, each bank of lights may be controlled as a unit from a main switch in each bank vault, and each light may be individually controlled by a secondary switch between the main switch and each light. This system gives the entire installation extreme flexibility, making possible many combinations in the use of the various lights, and simplifying any necessary service or repair work.

In addition to controlling all main circuits from the primary vault, power lines for the local depot lights are fed from this source. There are also two secondary vaults, completely underground in front of the hangars, from which the exterior hangar lights are fed.

INSTALLATION of this equipment on the Grand Central Air Terminal has required approximately eight months, having been completed just in time to meet the demands of long winter nights and added late schedules inaugurated to satisfy growing traffic.

The beacon and course lights, boundary and approach lights, and wind direction indicator lights are kept burning throughout every night and an attendant is always on duty in the control tower to switch on whatever field lights may be required by arriving or departing planes.

Lighting of the Grand Central Air Terminal is believed to be the most modern of any such installation yet made, having been made so to meet the requirements of the greatest air transport traffic, from the standpoint of passengers enplaning or deplaning per month, of any air terminal in America. Approx. 6,000 passengers in September alone, 1929 record month. This lighting equipment is playing a big part in carrying air traffic figures for this terminal to constantly greater totals, for the public instinctively trusts all companies based at and regularly operating from a field where such vast attention is given to the problem of night operations.

The Grand Central Air Terminal lighting is a big step forward in the direction which airports and airlines must go, for not until all routes and fields are sufficiently lighted to make night flying as practicable as day flying can we expect unreserved public patronage of airlines. Los Angeles, with not one, but ten, lighted airports, should prove a magnet for operators who find it most practical to send planes into this area after dark. The way in which western flying schedules are being extended regardless of the sun, with patronage increasing accordingly is an indication to the air transport industry of the great traffic reservoir which can be tapped by the provision of adequate night lighting.

GENERAL NEWS

HERBERT F. POWELL, *News Editor*

HIGH POINTS in the NEWS

▶ *Back to work.* Aeronautical Chamber of Commerce New York air show is concluded on May 11, with an attendance of 120,000 and sales said to amount to $750,000 for the nine-day exposition.

▶ *What to use.* More than one hundred and fifty attend the Sixth Annual Army-Navy Standards Conference at Dayton. Material specifications adopted.

▶ *Necks craned.* Scores of Navy planes maneuver over New York show May 7, 9, and over New England cities May 8. Army craft also participate.

▶ *Another shiny one.* Introduce bill at Washington asking for design, construction, and procurement of a metal-clad airship for the Army.

▶ *Shift.* Engine division of the Curtiss Aeroplane & Motor Co., Buffalo, is to be moved to Wright Aeronautical Corp. plant, at Paterson, N. J.

▶ *Revised.* Operating from an unlicensed field is one of the acts now allowed under the altered Michigan air code.

▶ *No.* N.A.A. now decides National Glider Association should not be allowed privilege of issuing the three classes of glider licenses and sanctioning glider meets.

▶ *Gold medal.* Dr. Ludwig Prandtl, professor at the University of Goettingen, Germany, is awarded second Daniel Guggenheim medal.

▶ *Sergievsky again.* By climbing to 26,000 ft. or more in a Sikorsky S-38 seaplane, Capt. Boris Sergievsky, chief Sikorsky test pilot, breaks the American record of 22,178 ft.

Airports and Airlines

▶ *Under actual conditions.* First visual type radio range beacon to be used on a regular airway will be located at Bellefonte, Pa.

▶ *Certificates.* On and after midnight of May 15, airlines must have a Certificate of Authority to operate, obtained from the Department of Commerce.

▶ *Another Inc.* Form Aeronautical Radio, Inc., to handle wave lengths allotted to air transport companies.

Foreign

▶ *Over Italy.* Forty-one stops are to be made on Italian Light Plane Tour, August 25-31, being managed by Royal Italian Aero Club and *Il Popolo d'Italia.* $15,750 in prize money planned.

Michigan Licenses 41 Schools

LANSING (MICH.)—There are now 41 schools in Michigan which have been licensed by the State Board of Aeronautics of which number six are Transport schools. Temporary licenses were recently issued to Upper Peninsula Airways, Inc., of Escanaba, and the Northern Aircraft Corp., Flint, both of which offer complete ground and flying courses. Capt. Ray Collins, State Director of Aeronautics, has practically completed his inspection of airports and schools.

Curtiss Plans Changes In Factories at Buffalo

BUFFALO (N. Y.)—Plans for the discontinuance of the engine division of the Curtiss Aeroplane & Motor Corp. at Buffalo, and the consolidation of all plane production and assembly departments at the Kenmore plant of the company are now underway.

The engine plant, located in Kenmore Avenue just outside the city, will be transferred to the Paterson, N. J., factory of the Wright Aeronautical Corp. The Kail Street plant, where all airplane parts excepting power plants are manufactured, will be moved to the Kenmore plant, built and equipped less than a year ago at a cost of $4,000,000. The Kail Street property will be abandoned.

Between 1,600 and 1,700 men, including the office staffs, are now employed at the two Buffalo plants. At the Kail Street factory more than 800 men are employed on the day shift and 300 nights, while the engine division employs between 500 and 600. The weekly payroll of the two factories amounts to about $50,000.

Error Brings Jackass Award

OAKLAND (CALIF.) — A small bronze jackass with wings, the whole neatly mounted on a walnut stand, is the award now available for student pilots who commit errors of judgment at the Boeing School of Aeronautics, this city.

The first student to become the possessor of this handsome piece of statuary was a flier who went out at night and flew without use of his navigation lights — only to turn them on for taxiing purposes after he had landed.

Estimate 120,000 Saw N.Y. Air Salon

Report $750,000 in Sales For Nine-Day Exposition

NEW YORK (N. Y.)—Having attracted a total attendance estimated at 120,000, with first reports from exhibitors indicating that plane, glider, and engine sales during the exposition aggregated approximately three-quarters of a million, the affair was pronounced a success.

Plans to hold another show next year were being made by the Aeronautical Chamber of Commerce as the first New York Aircraft Salon closed at Madison Square Garden, May 11, after running from May 3.

Air transport was the angle stressed at the Salon, and the public's attention was drawn to this by the six transport machines clustered in the main arena. Speeches delivered during the event centered around air travel, its development and possibilities.

Chevrolet Cup to F-32

Show visitors in most cases were immediately drawn to the large planes, and one of them, the Western Air Express Fokker F-32, which stood in the main entrance, was examined by spectators at the rate of hundreds each hour.

The "most beautiful plane in the show" was the designation awarded the F-32, thus making W.A.E. the recipient of the Bates Chevrolet Co. cup in the show awards.

For assembling a large fleet of planes to fly over New York the opening day, and for promoting air transportation by giving free flights during the exposition to many hundreds of business leaders, the Curtiss-Wright Corp. was honored with the grand prize—the B. Altman cup. The title of "the best special feature promoting air transportation during the New York air show" went with this award.

Other Awards

Five planes displayed on the exposition floors and enclosed by a Spanish-style wall won for the Curtiss-Wright Flying Service a trophy presented by the Long Island Chamber of Commerce for the best airplane exhibit.

The Aluminum Company of America, which won the sweepstakes prize at the St. Louis show, this time won a cup presented by the Warren Nash Motor Corp. for the most attractive display comprising more than four booths.

For its display arrangement, the main attraction of which was a huge map of

(*Concluded on Page 998*)

Estimate 120,000 Saw New York Salon

(*Concluded from Page 997*)

its lines, Pan American Airways, Inc., was presented with the the two to four-booth trophy, donated by the Heather-Mathew Co., this city.

Another prize-winner was the New York State Aviation Commission, adjudged the best single booth attraction, thus receiving a trophy from James Hearn and Son.

The jury of awards consisted of Wallis Howe, Jr., chairman, eastern advertising manager of the *Atlantic Monthly;* Charles Hathaway, Jr., account executive, Sound Studios of New York, Inc.; Miss Esther Lyman, merchandising stylist, Cheney Bros.; Miss Christine Holloway, merchandising stylist, Phoenix Hosiery Co.; Herbert Brucker, Associate Editor, *Review of Reviews;* and Robert Campbell Paradise, D.S.C., Army World War Flying Ace.

Shell Shows Pageant of Progress

Large lighted maps showing routes made the New York, Rio & Buenos Aires Lines, Inc., T.A.T.-Maddux, Pan American Airways, and U. A. & T., Boeing, and N.A.T. booths especially interesting. The first-named company also had a grouping of photographs showing the 35 Fords, Commodores, Fleetsters, and Sikorskys employed on its services. The Commodore "Argentina," NYRBA show plane, was christened during the week by Mrs. James J. Walker, wife of Mayor Walker.

One of the most extensive of exhibits was the $160,000 history of American transportation, staged by Shell Eastern Petroleum Products, Inc., in ten episodes. One-third scale models of historical conveyances were pictured in surroundings true to life at that time.

Small movies were shown in connection with the Dornier Company of America display, which featured a Britannia metal model of the Dornier Do.X built at the Dornier plant on Lake Constance and valued at approximately $4,000.

By turning on an electric switch, a person could see the lifting force of air on a small model airfoil in a contrivance found in the Museum of Peaceful Arts booth.

Many Notables Attend

Western Electric and the New York Telephone Co. offered visitors an accurate picture of air travel communications in use. The former, through a map, models, and movies, illustrated the functioning of the two-way radio telephone between planes and the ground, and the one-way radio telephone system for receiving weather reports and directional signals. The latter showed how messages are received via the telephone typewriter machine.

An Air Travel Information Bureau, giving data on lines, schedules, and rates, was set up at the *Herald Tribune* booth during the show and is to be continued at the newspaper's headquarters, 225 West 40th St.

Dozens of photographs of Byrd's ant-arctic flight and other historical air ventures were hung in the New York *Times* show section and proved interesting to the exposition crowds.

A roster of the many thousands who visited the New York Aircraft Salon and were introduced to the public would contain numerous names of well known aviators. Too, there were several diplomatic officials were present during International Day, May 7.

Many new flying students were signed up for courses while visiting the exhibition, it is revealed, some $56,500 worth of training being "ordered" by nearly 250 persons.

Curtiss-Wright Flying Service stated it had negotiated for $30,000 of student flying business, Roosevelt Flying Service obtained 25 new students, and 125 signified their intention of taking gliding courses at an Eastern school which W. Hawley Bowlus is to open.

Planes declared sold were mostly sport and training types, while with few exceptions, the machines are to go to private owners. A preliminary list of planes, gliders, and engines contracted for follows: Ten Whirlwind Bellanca Pacemakers (six to the Canadian Department of National Defence), six Curtiss-Wright planes (two Keystone-Loening Commuters, two Curtiss Robins, Travel Air, Gipsy Moth), two Ireland amphibions, a Club Ford (show plane), ten Wacos and nineteen Waco gliders, eight American Eagles, three Sikorsky S-39's and S-38, seven Monocoupes, three Savoia-Marchetti S-56's, 27 Peel glider boats, six Aeroncas, Fairchild KR-21, three Cirrus-powered Whittelsey Avians, four Axelson-powered Swallows, three Brunner-Winkle Birds, one Great Lakes trainer, one New Standard Trainer, one GAC Aristocrat, four Bowlus primary gliders, eleven Wright engines (five Gipsys, two Whirlwinds, and four Cyclones), fourteen Kinners (eight to New Standard, six to Brunner-Winkle), and two Menasco Pirates.

A view of the main hall. The Nyrba Commodore "Argentina" is shown in the foreground, while a Bellanca seaplane "flies" above

Bill Asks Procurement Of Metal-Clad for Army

WASHINGTON (D. C.)—On May 6, Senator Arthur H. Vandenberg, Michigan, and Congressman Florence P. Kahn, California, introduced a bill calling for the design, construction, and procurement of a metal-clad airship for the Army Air Corps.

Provisions state the ship is to be of approximately one hundred long tons gross lift and 4,000,000 cu.ft. displacement, not to exceed $4,500,000 in cost, and construction to start as soon as possible and prior to July 1, 1932.

The statement accompanying the bill's introduction mentions those purposes for the craft, namely: Mississippi flood relief, military preparedness, and foreign trade.

It is declared the procurement of the ship would not be in conflict with the policy laid down by the joint Army and Navy Board concerning the development and use of rigid airships approved Jan. 12, 1920, as is shown by the following excerpts:

"3. In accordance with the proposed policy, no restriction should be placed upon the use of rigid dirigibles by either air service if, after development, it is considered that such type is required in the accomplishment of the functions of either air service.

"4. That no restriction should be placed upon the use of the rigid dirigible by the Army if, after development, it is considered that such type is required in the accomplishment of the functions of the Army Air Service."

Golden Eagle Orders Kinners

COLUMBUS (OHIO) — Announcement is made here that an order for 50 Kinners has been placed by the Golden Eagle Aircraft Corp.

Here and There at the New York Salon

A LARGE exclamation point—and we say it with one—was the red bedecked corps furnished by a theatrical agency for the purpose of selling the show programs. Plane salesmen, we venture to say, might pick up a couple of ideas therefrom. Those girls had sticktoitiveness!

Still we think that buttons should have been furnished those who had made purchases of programs to let the girls know one was no longer in the market. . . . The minute one laid his program down there would be a swish of red on the way thinking he hadn't got one.

It was striking to note how the six transports completely filled the main hall of the Garden. Even so it was not without putting plenty of rudder on several of the planes to keep them from ramming each other.

Special thanks goes to the Sikorsky firm for the design of the S-38 whereby a leather bumper is carried on the nose. Said nose came perilously close to the Packard Diesel exhibit—and the visitor who found himself pushed in the back deeply appreciated the pillow effect thereof.

Our friend J. T. N. was all for a little experiment. His idea was to install the I-F engine with its 1,800 horses in the Aeronca.

We were happy to see the real commercial aero spirit in evidence with less models, motorcycles and monstrosities.

By the last we mean those scale-built combination dirigible-Leviathan-aircraft carriers. The nearest they got to this show was the store windows in the immediate vicinity of the Garden.

Something or other threw a monkey wrench in the plans of the Air Corps to parade over the city for the opening of the Salon. Credit goes to Curtiss-Wright for gathering several score planes to fill the breech.

Fate apparently plays a hand when it comes to air parades opening aircraft shows. We can't remember one that has gone off exactly as planned.

The greater percentage of adults and less of kids at this show was pleasing. We do not recall any swarming sortees of youngsters except on Saturday—their own day.

We heard a story during the show of how "Casey" Jones spoke before a group of the younger generation a short time ago, closing with the remark that questions were in order. . . . It turned out to be a mistake, for a flood of queries on aerodynamics, torque, moments, and fitting sizes came in which would have kept the Guggenheim schools busy for a week.

Still, all the youngsters don't know the subject as well as some would lead us to believe. One kid we saw watching the Do.X movie noted the pilot moving the Dep control. "That fellow's steering wheel is loose," remarked the kid.

Which reminds us of a boy we once saw at Curtiss Field examining a plane. This particular one indicated an aileron, telling his friend the wing was broken.

According to a story "Deke" Lyman of the *Times* was telling Sloan Taylor, the Fokker company was subletting exhibition space in the F-32.

Many persons got the idea that the NYRBA Consolidated Commodore was an amphibion because of the supporting wheels used. The wheels were later covered with dark cloth to allay that suspicion.

The radio address system in use at the show, while good a great part of the time was quite rasping at others. Possibly a little study of radios and their show use might be made.

We are reminded again, this time of the announcer who mentioned the Hon. David Ingalls as "Assistant Secretary of War for Aeronautics." When next we heard the name "Davison" spoken we waited eagerly to hear what his position was. It developed that he was "Assistant Secretary of the Navy for Aeronautics."

Either that is wrong or there has been a little "swapping" of jobs in Washington.

The value of small moving picture projecting machines as crowd attractors is now quite conclusively proved. Many of the exhibitors used films, and were amply repaid in booth visitors.

More than 600 hr. on the air were totaled in radio publicity for the Salon. Besides the direct broadcasts, several firms having connections with the industry gave time in their regular hours.

The P. & W. and Wright engines displays were high in the contrast list. The former firm's booth carried a background of night-like ebony drapes, while the latter's background was quite the opposite, eye-dazzling silver being employed.

One of several things demonstrated was that the Garden was not big enough for the Salon. Five planes would have fitted the main hall better than six and would have spared many persons bumped heads, while offering them better views of the craft. Planes in the lower hall were crowded still more.

The several planes and gliders relegated to the flying position by suspension from the ceiling showed to best advantage, we thought. A fine view, too, was to be had from the mezzanine, both of these craft and of the striking wing spreads of the transports below.

We noticed two men entranced by the Fokker F-14 which hung above its big brother, the F-32.

"Doesn't that plane look familiar," said one?

"Yes," replied the other, "that's the plane Colonel Lindbergh flew his mother somewhere in." The other seemed a little perplexed by this.

"I guess you're right," he finally admitted, then—"No, I don't know about that. I think on Lindbergh's ship the things were a little lower."

We gather that he meant the wings.

—H. F. P.

Federal Library Seeks Aviation Division Funds

WASHINGTON (D. C.)—In order to take care of its increasing aeronautical library, the Library of Congress has secured authorization in the pending legislative appropriation bill for salaries for a chief and an assistant to head an aeronautical division.

Discussing the subject before the appropriations committee, Dr. Herbert Putnam, librarian, pointed out that the library has received $51,000 from the Guggenheim Fund for the purchase of material in the literature of aeronautics. Dr. Putnam also explained to the committee that $75,000 has been donated by the Guggenheim Fund as an endowment for a chair of aeronautics.

By reason of the funds received, the Library of Congress was able to start the new aeronautical division on January 1, with Albert F. Zahm, professor of mechanics and an aeronautical engineer, at its head. Dr. Putnam told the committee that authorization for the continuance of the salary of Mr. Zahm is now necessary.

The aeronautical division of the library already has accumulated four collections from London, including one French collection of great repute. The Langley collection is now in the congressional bibliotheca, having been transferred from the Smithsonian Institution.

Byrd Aided Via Radio

Previous to these new acquisitions the holdings of the library consisted of 3,000 volumes. The total collection, eliminating duplications, now comprises 10,000 volumes, and is regarded by aeronautical engineers as being unquestionably the finest collection in the world. As an example of the service that the new division is rendering, Dr. Putnam stated that a radio request from Admiral Byrd at the South Pole has been complied with which aided him in making terrestrial maps from air photographs. Admiral Byrd's request was for the names and publishers of books and pamphlets on the subject of aerial oblique mapping.

It was also brought out at the hearing that a brief history of the growth of aerodynamics during the past 50 yr. was prepared by the new division for the American Society of Mechanical Engineers. Dr. Putnam told the committee that in addition to these cases, the staff of the new division has supplied a large amount of material on aeronautics at the request of various agencies and persons in need of such information.

A-N Conference Held at Wright Field

Specifications Adopted On Materials, Accessories

DAYTON (OHIO)—The sixth Annual Army-Navy Standards Conference for the standardization of aeronautical materials, parts, and accessories, held here May 5-8, was attended by more than one hundred and fifty representatives of the Services and the commercial industry. The meeting was opened Monday afternoon at Wright Field, with a few words of greeting by Brig. Gen. B. D. Foulois, Chief of the Materiel Division of the Air Corps, after which Maj. C. W. Howard, the general chairman of the conference, took charge.

Six groups of the conference were in session simultaneously at all times, the subjects being so scheduled and the work so well prepared in advance as a result of the preliminary conference held last December, that the schedule was regularly adhered to at all sessions. Covering as it did such a wide scope of activity, the findings of this conference are best recorded under the group headings of the respective sessions.

Materials

This group was presided over by J. B. Johnson, chief of the materials branch. Detail specifications for chrome vanadium medium carbon steel (SAE 6135) bars and billets, and chrome vanadium high carbon steel (SAE 6150) bars, were adopted. The A-N specification for chrome molybdenum steel (SAE 4130) sheet or strip was revised in quite a few details, the principal revision being in the reduction of the physical properties of the material in the normalized condition. The requirements for corrosion resistant chrome-nickel steel sheet or strip were established, and specifications covering heat treated carbon steel spring wire and 7x19 extra flexible steel cable were likewise adopted. Streamline and internal tie-rod specifications were revised by the addition of all necessary details and tests for the inclusion of corrosion resistant steel tie-rods, and certain minor dimensional revisions were made to co-ordinate with the new pending SAE standard for the same material.

The specification adopted for heat treated aluminum alloy forgings covers two grades of material, the difference being in the chemical composition. Grade No. 1 is similar to the alloy used for sheets, bars, and tubes, and is superior to Grade No. 2 in corrosion resistance. Grade No. 2 covers heat treated alloy forgings suitable for aircraft propellers and other highly stressed parts. In adopting a standard for aluminum and aluminum alloy rivets, it was agreed to revise the present A-N specification for aluminum alloy rods and bars to include rivet wire in lieu of the present separate specification.

A specification was adopted for brass alloy bars for turnbuckle barrels. The A-N specification for copper tubing was revised to call for material in the half hard condition rather than in the annealed dead soft for greater rigidity in handling. It was further agreed to prepare a specification for manganese bronze castings.

Instruments

This group convened under the direction of Maj. A. H. Gilkeson, chief of the equipment branch. The findings consisted primarily of detail revisions and the addition of manufacturing tolerances to inclinometers, altimeters, airspeed indicators, tachometers, fuel and oil pressure gauges, and thermometers.

Airplane Parts

This group was headed by Lieut. F. O. Carroll, chief of the airplane branch. Of major significance were the specifications on landing wheels, and the revision of the weight control form. Complete specifications for ball bearing control pulleys were evolved, and the preliminary steps taken for the standardization of the control of installation dimensions for cockpit assembly, including all controls, seats, brake pedals, instruments, etc.

In response to an almost universal demand on the part of airplane designers for closer tolerance bolts, the permissible variation in tolerance on diameter was reduced over 50 per cent. Additional bolt diameters up to 1 in. were provided for, and other minor adjustments made. Detail drawings for cowl fasteners, pins, and hinges were adopted and a standard of rib lacing spacing established.

Power Plant

This group was convened under the direction of Lieut. E. R. Page, chief of the power plant section. The small engine parts (presented in detail in an article in AVIATION, for April 26, p. 839-843) were adopted as standards. Significant decisions were to conform to the old SAE standard for bolt head and nut sizes, to permit the option of either SAE 3140 or SAE 6150 steel for alloy steel parts, to parkerize nuts in place of cadmium plating for easy distinction from airplane nuts, and to omit plating finish from lock washers and lock rings.

The adoption of an acceptance test for aircraft engines in production was of major significance. A spark plug terminal which is resistant to failure through vibration was also standardized. The starter drive jaw diameter was revised from $2\frac{3}{8}$ in. to agree with the SAE standard of $2\frac{1}{4}$ in. Of minor significance were the adoption of lubricating fittings standards, specifications for rating aircraft engines, and half-section radiator core details.

Propeller

This unit was directed by Mr. Dickey, in charge of the propeller group. On propeller hubs there was a reduction in tolerances on most dimensions to assure better balancing of the propellers in the hubs. The propeller hub spline was also reduced in tolerances to conform to the SAE standard. The clampring was modified in some dimensions for better fit and more positive clamping action on the hub housing.

Electrical

The electrical group convened under the chairmanship of Lieut. D. L. Bruner, in charge of the electrical unit. The differences in the two service specifications for storage batteries were considered and the specifications homologated. The high tension ignition cable specification was standardized, with a provision for marking cable to assure that only freshly insulated cable is used in all engine installations. The low tension cable specification was recommended for further development.

Paint and Dope

This group was under the leadership of Mr. Young, of the chemical laboratory of the material branch. The A-N specification for cellulose nitrate dope was revised to exclude the use of chlorinated compounds or other toxic or saponificable chlorine derivatives. Benzine being considered as coming within this category, its use as an ingredient was prohibited. It was further agreed that the use of scrap celluloid would not be permitted in the manufacture of dope, and certain additional minor changes were made.

As far as the Army and Navy were concerned, it was agreed not to standardize on an acetate dope, as its use is rapidly diminishing and the Navy at present does not use it at all. With further reference to dope, it has been the practice to permit the dope manufacturer to recommend a thinner suitable for his product. It was agreed that a specification for dope thinner would be more satisfactory and one will be prepared accordingly.

Miscellaneous

The clothing group, under the chairmanship of Major Hoffman, adopted standard specifications and drawings for flying jackets, summer helmets and summer flying suits. Parachute standardization was discussed in general terms.

The textiles group, under the direction of Mr. Cleary of the materials branch, considered specifications for linen webbing, wool felt, and revisions to the inner tube specification.

New Boeing Low-Wing Put Through Initial Tests

SEATTLE (WASH.)—Initial test flights of the new Boeing Model 200, all-metal low-wing monoplane, whose trade name will be "Monomail," are under way here. The Monomail, which uses the 525 hp. Hornet engine, has a pay load of 2,000 lb. Upon completion of the preliminary flight tests and approval by the Department of Commerce, the airplane will be turned over to Boeing Air Transport for tests under operating conditions.

Another plane of the same design, now under construction, will carry six passengers and 800 lb. of mail. The plane has retractable landing gear, a special Boeing nose cowling, and other engineering and manufacturing features.

Although of monocoque construction, the Monomail has full longerons for added bracing. With smooth skin type of construction, rivet heads flush with the surface, and retractable landing gear, the design is particularly clean.

Build New Crown Factory

LOS ANGELES (CALIF.)—A new factory is now under construction for the Crown Motor Carriage Co., manufacturer of the Crown B-3 biplane.

Changes are Made In Michigan Air Code

LANSING (MICH.)—As a result of intense survey and coöperation of the aircraft industry, the newly created Michigan Board of Aeronautics has made some very essential and important changes in their state air code, chiefly that of eliminating the unlicensed field ban, which caused considerable discussion throughout aeronautical circles in the State.

The Board has for the present lifted the ban on landing and operating commercially from the unlicensed field, and it is now permissible to operate anywhere in the state, as was the case prior to the initial enactment which prohibited this.

Another important change in the air code is that of requiring that the school have "one airworthy plane for each fifteen students normally enrolled in the school"—the new code now reading as follows: "The school shall have at least two airplanes for training purposes in an airworthy condition at all times." This change was decided upon, it is believed, because of the fact that it is difficult to determine the enrollment with students enrolling today and dropping from their courses in a week or ten days due to various reasons.

Chute Ruling Modified

The qualifications for a ground instructor teaching airplane and engine courses have been raised, and it is now required that such applicant hold an Airplane and Engine license of the Department of Commerce.

The requirements as regards the use of parachutes during training have been modified and now require that "modern parachutes of the type approved by the Department of Commerce must be used during advanced instruction periods."

The state air code requires that the school graduate the Private Pilot in four months, the Limited Commercial in six months, and the Transport Pilot in eighteen months. Waivers can be obtained on these limitations on special cases where the student is paying for his course as he goes along, or where the student is obtaining instruction at various intervals, and not on regular class schedule.

Student Planes Must be Housed

For the public safety of the student aviator, a limitation has been placed on the minimum sized field to be used in student instruction work. The code requires that the minimum sized field shall be one having at least 1,500 ft. of effective landing area in all directions, with clear approaches, or it shall have landing strips not less than 400 ft. wide, permitting landing in at least six directions at all times. It is further provided that all planes used for student instruction work must have hangar space to assist in keeping the equipment in an airworthy condition.

Capt. Ray Collins, State Director of Aeronautics, has spent the entire last two months in inspection work. In his report to the Board he pointed out that Michigan now has approximately 65 commercial airports, all of which have been temporarily licensed, 39 aviation schools, of which six offer the full Transport course. Together with the airport manager's licenses, flight instructors, etc., a total of 287 temporary licenses have been issued.

To Commemorate First Albany-New York Flight

NEW YORK (N. Y.)—Through the Aeronautical Chamber of Commerce plans are being made to observe the 20th anniversary of the first airplane flight between Albany and New York with an aerial demonstration and other features on May 30.

Aviation's progress within the past two decades will be stressed, states Frederick B. Rentschler, president of the Chamber, in making the announcement. It was on May 29, 1910, that Glenn H. Curtiss flew one of his planes from Albany to this city.

Whereas it was planned to fly an original Curtiss model plane over the course as part of the commemoration, it now appears that this endeavor cannot be fulfilled. Instead, a Curtiss Condor will make the trip carrying as many as possible of the invited spectators of the famous 1910 flight.

The committee appointed by Mr. Rentschler to make arrangements for the commemoration includes: F. Trubee Davison, Assistant Secretary of War for Aeronautics; Harry F. Guggenheim, Ambassador to Cuba; W. Irving Glover, Assistant Postmaster General in Charge of Air Mail; David S. Ingalls, Assistant Secretary of Navy for Aeronautics; Governor Morgan F. Larsen, of New Jersey; Governor Franklin D. Roosevelt, of New York; Mayor John Boyd Thatcher, of Albany; Mayor James J. Walker, of New York; Senator J. Griswold Webb, chairman, New York State Aviation Commission; and Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics. Frederick B. Rentschler is chairman of the committee.

Ex-Cell-O Acquires Tool Firm

DETROIT (MICH.)—Ex-Cell-O Aircraft & Tool Corp. announces the acquisition of the Continental Tool Works, of this city. The Continental firm, manufacturer of metal cutting tools, occupies a modern plant of some 50,000 sq.ft. of floor space. This affiliation adds to the Ex-Cell-O line such precision tools as counterbores, ground thread taps, and milling cutters.

Test Air Wheels on Navy Craft

SEATTLE (WASH.)—The Boeing Airplane Co. is building a special landing gear for a Navy Boeing pursuit plane to mount the Goodyear Air Wheel. Tests on this gear will be watched with interest as to effect of large tires on high speed and rough landings.

Florida Aero Meeting To Be Held on May 23

SARASOTA (FLA.)—Florida's second semi-annual statewide aviation conference will be held in Tampa, May 23, according to an announcement made here by Frank Redd, Sarasota, chairman of the Florida State Chamber of Commerce aviation bureau, under whose auspices the meeting will be held.

The Tampa conference will have as its objective the bringing together of delegates from air-minded communities and organizations of the state for a general survey of Florida aviation problems. The State Chamber of Commerce aviation bureau, under the direction of Paul Grassfield, has begun work on a program which is to assure consistent aviation progress in the state. This program will be presented to the conference and will form the basis of the meeting discussions.

Items which will appear in the program include legislation for the promotion of aviation, printing of a Florida aerial map and its distribution, model airplane contests, promotion of an aviation month, and the publicizing of Florida's aeronautical advantages.

The committee will also make plans to have the tax on gasoline sold at airports diverted from the state road department to the improvement of airports and landing fields.

To Consider Emergency Fields

Another measure to be considered, which was defeated at the last session of the legislature, has to do with the construction and support of emergency landing fields adjacent to state highways.

Members of the group sponsoring the meeting include Frank Redd, chairman; Governor Doyle Carlton, honorary chairman; L. D. Reagin, Sarasota; Andrew Heermance, Miami; Col. Earl Wheeler, Daytona Beach; E. C. Nilson, Orlando; Adrian E. Langford, Pensacola; Fred V. Blair, St. Petersburg, R. Wallace Davis, Tampa; C. L. Waller, Tallahassee; M. D. Carmichael, West Palm Beach, and R. W. Cushman, Jacksonville.

Following the conference in Tampa, representatives of the committee will be appointed in all sections of the state to form local contacts between the state chamber committee and their respective communities. From time to time meetings will be held at various points in the state.

Receive Cirrus Derby Entries

MARYSVILLE (MICH.) — More than fifteen entries have been received for the All-American Flying Derby, states F. R. Maxwell, Jr., president of American Cirrus Engines, Inc., managing the race. Maj. Luke Christopher, secretary of the National Aeronautic Association contest committee, and Ray Cooper, Michigan representative of that body, will leave shortly on a pathfinding tour of the 7,500 mi. derby, which is to leave Detroit, July 21, according to present plans.

Many Service Planes Stage New York Tactics

NEW YORK (N. Y.)—In connection with the New York air show last week, Navy and Army fliers provided this city with maneuvers participated in by scores of planes manned by over two hundred officers and enlisted men.

About noon on Wednesday, May 7, 134 planes from the Naval aircraft carriers "Lexington," "Saratoga," and "Langley," stationed at Hampton Roads, arrived over Manhattan, displayed various maneuvers under direction of Captain Kenneth Whiting, and then landed at the Naval Reserve base, Curtiss Airport, Valley Stream, L. I.

The following day the ten squadrons, composed of 36 torpedo and bombing planes, 57 fighters, 24 scouting craft, and staff planes took off for a New England tour, visiting among other cities Boston, Springfield, Hartford, and Providence, before returning to Valley Stream for the second night.

It may be stated that the news editor of AVIATION had the pleasure of accompanying the Naval planes in the flight to Boston. He was carried by pilot McPherson and co-pilot Bonham in a Martin T4M-1 plane, flying in a Vee of eight such craft from the carrier "Saratoga."

As a parting gesture before leaving for their ships, the Navy fleet made a theoretical attack on the city Thursday morning executing diving attacks. The attack centered around the Hotel St. Regis, from which point the maneuvers were observed and broadcast over the radio.

Mid-day on Friday fifteen Curtiss Falcons from Mitchel Field, representing the 1st, 5th, and 99th Army Air Corps Observation Squadrons, circled over New York under command of Capt. Edwin House, Lieut. Frederick Evans, and Lieut. John Kase. As the "Los Angeles," the metal-clad ZMC-2, and the small airship J-2 were only then disappearing in the distance after flying here from Lakehurst, spectators had an almost continuous air show for approximately three hours.

Name Airmen's Hosts

While here, the Navy fliers were the guests of the Aeronautical Chamber of Commerce and their expenses were shared by the following aeronautical and financial leaders: James C. Willson, C. M. Keys, Hugh Baker, Richard F. Hoyt, J. Cheever Cowdin, Stuart Reed, E. A. Pearce, W. Averill Harriman, and Robert H. Lehman.

Army Orders Eight Fairchilds

NEW YORK (N. Y.)—A contract calling for delivery of eight model 71's to the Army Air Corps, Materiel Division, Wright Field, Dayton, Ohio, has been received from Fairchild Airplane Manufacturing Co., Farmingdale, N. Y. These Wasp-powered planes will be used in photographic work.

The 2-T flight of Martin T4M-1 torpedo planes on the peaceful invasion of New England. Though there may be some slight difficulty in recognizing him, the news editor of Aviation may be seen in the rear cockpit of plane 2-T-2

N.G.A. Clubs Now Number 50

DETROIT (MICH.)—A 100 per cent increase in the number of glider clubs in the U. S. since Jan. 1, 1930, has been announced by D. F. Walker, manager of the National Glider Association. Fifty clubs, with 2,000 members, are now affiliated.

Schlee-Brock Buys John R Field

DETROIT (MICH.) — Schlee - Brock Aircraft Corp., Lockheed, Bach, and Driggs Skylark distributor here, has purchased John R Airport at Sixteen Mile and John R roads and within a short time will make that airport their field headquarters, according to a recent announcement by Edward F. Schlee, President. John R Airport contains a total of 200 acres and has been used for several years by various commercial operators. The Schlee-Brock purchase price is said to have been $264,000. The field now has one 60 ft. x 180 ft. hangar and others will be added, Mr. Schlee said, as fast as they are needed. Wires now bordering the field will be placed underground and the airport will be thoroughly modernized, according to the Schlee-Brock plans. The airport will be employed as a base for one of a chain of flying schools to be established shortly by Schlee-Brock. The two Schlee-Brock buildings on Detroit City Airport will be sold, it was said.

Stinson Reports Production

WAYNE (MICH.)—Production figures are announced here by the Stinson Aircraft Corp. They are as follows: Schedule for May, 90 planes; unfilled bona fide orders May 1, 76; record month to date, April with deliveries of 35 craft; April sales, 32 Lycoming Stinson Juniors, one Packard Diesel Junior, two six-place Detroiters with Wright 300's. William A. Mara announces further that the dealer organization of the firm has been increased 116 per cent with fourteen dealers added in April.

More Planes, Engines And Schools Approved

WASHINGTON (D. C.)—Aeronautics Branch has issued approved type certificates for four more planes, three engines, and three flying schools. According to certificate number, make and designation, type, power plant, weight empty, useful load, and gross weight, the craft are as follows: No. 318—Alexander Bullet C-7, four-place cabin monoplane, Wright Whirlwind 165, 1,708 lb., 1,082 lb., 2,790 lb.; No. 319—Bellanca Skyrocket, six-place cabin monoplane, Wasp-powered, 2,592 lb., 2,008 lb., 4,600 lb.; No. 320—Consolidated Fleetster 20, one-place open monoplane, Hornet B 575 hp., 3,333 lb., 2,567 lb., 5,900 lb.; No. 321—Star E Cavalier, two-place cabin monoplane, Lambert R-266, 919 lb., 506 lb., 1,425 lb.

Engine certificate No. 47 went to a Comet 7-E, a 7-cyl., radial, air-cooled power plant, with a rating of 165 hp. at 1,900 r.p.m.; No. 48 was awarded for a LeBlond 70 (Model 5D-E), 5-cyl., radial, air-cooled, engine, developing 70 hp., at 1,950 r.p.m.; and No. 49 is held by a MacClatchie Panther X-2, a 7-cyl., radial, air-cooled power plant, having a rating of 150 hp., at 1,900 r.p.m.

New schools given an approved rating are as follows: Curtiss-Wright Flying Service, North Carolina State College (ground), Raleigh Airport, Raleigh, N. C. (flying), ground and flying, Limited Commercial and Private; Hancock Foundation College of Aeronautics, Santa Maria Airport, Santa Maria, Calif., ground and flying, Transport and Private; Curtiss-Wright Flying Service, 1811 Main St. (ground), Owens Field (flying), Columbia, S. C., ground and flying, Limited Commercial and Private.

Sell Three Ryans to Airline

ST. LOUIS (MO.)—Among recent sales made by the Ryan Aircraft Corp. was one to the Robertson Airplane Service Co. of three Broughams for use on the St. Louis-New Orleans line.

C.I.T. to Finance Sales Of Savoia-Marchetti Craft

NEW YORK (N. Y.)—Commercial Investment Trust Corp., this city, is to act as financing agent for American Aeronautical Corp. dealers and distributors, word from the former concern states.

The arrangement covers the financing of both wholesale and retail Savoia-Marchetti installment sales throughout the United States and Canada and also applies to sales made direct by the manufacturer to large users, such as airline transport operators.

Sales financing agreements made between C.I.T. and other plane manufacturers include Detroit Aircraft Corp. and Consolidated Aircraft Corp.

Chamberlin Plans Aero Bureau

NEW YORK (N.Y.)—Clarence D. Chamberlin, trans-Atlantic flier, announces the formation of the Chamberlin Technical Bureau, which will disseminate free data and advice on aviation and aeronautical problems. Plans are being formulated to have experts on aerial legislation, navigation, radio, meteorology, planes, flying boats, amphibions, gliders, instruments, aerial commerce, engines, transportation, airports, and flying clubs answer the questions asked on those subjects. Headquarters of the bureau will be in the Chrysler Building and Miss Ruth Nichols, a well-known aviatrix, will be flying club consultant for the organization as well as executive secretary.

More Payload for N-S Trainer

PATERSON (N. J.)—An increase in the allowed weight and payload of the New Standard training plane has been authorized by the Aeronautics Branch, Department of Commerce, states the New Standard Aircraft Corp. Gross weight of the plane is now 1,790 lb. in comparison to the previous total of 1,610 lb. Payload allowance is thus increased 180 lb. Furthermore, test flights of the New Standard Sport Ship will be run off shortly. The sport model is a refinement of the regular Kinner-powered trainer, and has such features as streamlined fittings, brakes, starter, special colors, etc. Two of these planes have been contracted for and are now under way.

House Gets Legal Fund Bill

WASHINGTON (D. C.)—A joint resolution to provide an annual appropriation to meet the quota of the United States toward the expenses of the International Technical Committee of Aerial Legal Experts has been referred to the Committee of the Whole House on the state of the Union. The bill was introduced by Representative Maas, Minnesota, the only member of Congress who holds an active pilot's license.

New Name for Jacobs Company

PHILADELPHIA (PA.)—Henry M. McFadgen, vice-president and production manager of the Aircraft Engine Corp., this city, states the firm is now known as the Jacobs Aircraft Engine Co. The plant of this company, producer of the Jacobs 7-cylinder, radial, air-cooled 140 hp. plant, is located at Central Airport, Camden, N. J.

Deliver Six New Standards

PATERSON (N. J.)—Six Standard planes—three five-place craft and three Trainers—have recently been delivered by the New Standard Aircraft Corp., which, on May 1, increased its production schedule, operating at 60 per cent normal during the early spring. Distributors recently appointed by the company are National Airways, Inc., Detroit, for the state of Michigan; and Kenneth Unger, Hadley Field, New Brunswick, for Northern New Jersey.

Irving and Smith in Agreement

NEW YORK (N. Y.)—Irving Air Chute Co., Inc., Buffalo, has entered a cross licensing agreement with the newly-formed Floyd Smith Safety Chute Co., of Buffalo, according to a statement made by Lyman H. Ford, of the Irving firm, during the New York show. By this agreement, all engineering work, patents, and research of the Irving concern are made available to the Floyd Smith company, and vice versa.

Wing Spar Strength Tested in Laboratory

MADISON (WIS.)—Efforts to determine the amount of twisting and wrenching the wing spar of an aeroplane can stand without breaking have been made by the U. S. Forest Products Laboratory here through a series of bubble film tests.

Considering that the breaking point could not be figured out satisfactorily by mathematics or ordinary mechanical tests, the bubble method was employed. This consists of hollowing out a beam and then blowing a bubble out far enough to form a sort of flat pincushion shape. (The holes are made the same size and shape as cross sections of the beams studied.)

Accurate Within 4 Per Cent

As the air capacity of this bubble is a direct measure of the twist resistance of the solid beam started with, it was only necessary to ascertain the bubble's volume to get the result. A sharp-pointed micrometer screw was used for measuring purposes.

The laboratory tests were made on various types of aluminum wing beams and by comparison of bubble volumes; the twist resistance of each surface was determined, accurate to within 4 per cent. For these experiments, which required "tough" bubbles, triethylaminoleate was used and found to produce puncture-proof films when combined with water and glycerine.

"QUOTES"

This Gentleman Says Five. "I believe that transatlantic air transportation on regular schedules will be established within five years."—COL. CHARLES A. LINDBERGH.

—And This One Ten. "Ten years hence transoceanic service by air will be common. We expect the next decade will give us a fleet of Zeppelins with which we shall gain the supremacy in air passenger service."—DR. ADOLF SCHEURER, Managing Director, Hamburg-American Line.

A Worthy Attitude. "To enjoy flying and to make use of it in her work a woman must realize that under the right conditions it is as safe as any other form of transportation."—MRS. JOHN F. SIPPEL, General Federation of Women's Clubs.

—And One We Question. "I'll either break Colonel Lindbergh's record (across the continent) or break my neck in the attempt."—LIEUT. COL. ROSCOE TURNER.

Plugging the Gap. "Gliding will fill the gap between the younger boy or girl and those who consider themselves too mature to continue at model airplane building, yet are too young for actual aviation. If we can instill interest in this group, we have formed a foundation. At present there is no aviation foundation. It is only enthusiasm."—W. HAWLEY BOWLUS.

Quite a Few Hours. "No one should be permitted to fly alone until he has had at least 100 hr. in the air under instruction, and even then new things crop up to bewilder one, just as new situations come to the driver of a car on the road. Persons learning to drive a car, play a piano, or take dictation make mistakes as beginners and often as veterans, but these mistakes are not always serious because they are made on the ground. Too many amateur pilots are permitted to fly solo before they understand half the principles of aviation."—RAYMOND E. ELLIS, veteran pilot and instructor.

Openings—for Better Men. "There is hardly an aptitude for specialized work which cannot be suited to an opening in commercial aviation. I must, however, stress the fact that executives are not seeking simply manpower at present. Every position is occupied now. What the aviation executive seeks is a *better* man, for every position, than the man now at work. This indicates that the opportunity is greater than ever, but that the individual seeking it must be better qualified than ever before."—C. S. "CASEY" JONES, Curtiss-Wright.

AERONAUTICAL FINANCE

By R. R. Doane

Statistical Summary

Weekly Comparisons

	Week Ended May 9th	Previous Week	Same Week 1929
Aviation:			
Aviation stock averages	24.66	29.37	65.14
Number of stocks traded in (1)	49	45	66
Volume aviation share sales (2)	787,000	839,300	1,082,800
Ratio aviation share slaes to total sales (3)	2.04	2.38	3.36
General Market Data:			
Total volume share sales, N. Y. Stock & Curb Exchanges	38,467,370	35,185,870	32,193,255
Railroad share sales, N. Y. S. E.	839,580	448,600	521,180
Market averages (*N. Y. Times*)	237.19	242.45	254..01
New Domestic Financing	126,743,000	119,527,000	52,721,500
Financial: (000 omitted) (4)			
Reserve credit extended	951,095	982,225	1,281,912
Broker's loans	4,074,000	4,274,000	5,551,000
Bank exchanges, N. Y. C. H.	8,263,192	7,352,875	9,186,766
Investment reporting banks	5,791,000	5,791,000	5,875,000
Loans on securities, R. M. Banks	8,381,000	8,326,000	7,371,000
All other loans, R. M. Banks	8,583,000	8,629,000	9,067,000

Notes—(1) All stocks actively traded in on both New York Stock Exchange and the Curb Exchange; also contains over-the-counter stocks on which bid and ask quotations are regularly published. (2) Total volume both N. Y. Stock and Curb Exchanges. (3) Percentage of aviation stock trading to total volume of sales all classes of stocks on both exchanges. (4) Weekly Reporting Member Banks, Federal Reserve System.

Continued perplexity regarding the current business and financial situation seems to have been the ruling factor of late. At least this would appear to be the case if we accept the confusion in the security markets as a barometer.

Quite regardless of these recent erratic market changes the aviation stocks have stood the test exceptionally well, and on the whole have displayed an ability to maintain their gains with far more consistency than have many of the other more seasoned groups. As a matter of record aviation securities now hold second place among the twenty ranking groups for gains made during the first four months of this year—a singularly impressive fact in view of the wet blanket of gloom surrounding this industry not so many months ago.

As evidence of this exeellent performance the following comparative tabulation with industrials and rails from the high point of this year to the recent lows of the most severe decline the market has suffered during 1930 (May 3) discloses aviation stock averages to have been by far the least affected.

	Industrials	Rails	Aviation
Previous high 1930...	358.16	136.00	32.16
May 3rd average.....	322.19	121.56	23.03
Extent of decline...	35.97	14.44	9.13

The tables in the next column express changes in values of the major groups from the end of September, 1929, to April 30, 1930.

Throughout the past three months of irregular advance in security prices with a definite downward turn during April the trend culminated with a sharp liquidation on the second and third days of May. In such groups as the coppers, rails, and motors rather heavy liquidation was apparent while in the aviation stocks the ratio of *buying* to *selling* orders was notably well balanced.

Groups Showing Increases

Group	Amount
Aviation	+ $173,712,153
Chain Stores	+ 15,438,316
Department Stores	+ 6,136,955
Foods	+ 67,331,318
Leathers	+ 805,219
Mail Order	+ 43,774,241
Oils	+ 472,563,762
Public Utility	+ 19,994,973

Groups Showing Declines

Building	— $59,019,967
Chemicals	— 193,751,994
Coppers	— 488,000,508
Motors	— 241,555,984
Motor Equipment	— 19,350,648
Railroads	— 533,382,605
Railroad Equipment	— 53,048,688
Rubber	— 47,757,139
Steel	— 148,136,008
Sugars	— 7,800,588
Tobacco	— 49,006,983
Business	— 44,327,060

While this general unsettlement has been under way only eight out of twenty groups here tabulated were able to establish gains. The strongest stocks as a group were the oils, followed by aviation as a close second, with the conservative food stocks in third place. Practically all of the aviation stocks moved upward during this period, some of the outstanding leaders being United Aircraft & Transport, Aviation Corporation of the Americas, Western Air Express, and National Air Transport.

The classified table at the right supplies some interesting comparisons.

The total points gained in the sixteen companies up to May 8, since the low point of this year, stands at 140⅛. It will be further noted that the largest gains over this period have been in that of the transport division of the industry.

This record of the air stocks during the first third of 1930 should prove heartening to all interests in the industry as well as to all holders of aviation securities who have thus witnessed a steady return of intrinsic values. Unlike the market of a year ago such an upward movement has been consistent and stable and has not displayed the violent swings usually attendant upon blind speculative force.

In the more complex field of general finance the phenomenon of an almost universal reduction in central bank rates has occurred which brought our own rate down to 3 per cent on May 1. This is the lowest our central bank rate has been since 1924. In fact our rediscount rate has never been below 3 per cent during the entire history of the Federal Reserve System. It is therefore very unlikely that there will be any further reduction from this source, or that there is even a remote possibility of it occurring.

Another encouraging factor which seems to have been overlooked by many is that of the Federal Reserve Bank of New York's Index of the Volume of Trade which discloses an increase in distribution to consumer at the end of the first quarter of 2 per cent over January and 1 per cent over February as against a decrease in total productive activity of 1 per cent over January and

Manufacturing and Equipment Companies

Company	1930 Range Low	High	Last	Points Gain
Curtiss-Wright	6⅛	14⅛	11⅛	5⅛
Consolidated Aircraft	15	27⅞	21	6
Detroit Aircraft	5	8⅛	6⅛	1⅛
Douglas Aircraft	12⅛	23⅛	18⅛	5⅞
Fokker Aircraft	13⅛	34⅛	22⅞	9⅛
Irving Air Chute	12	27	22⅛	10⅛
Average	10.81	22.16	17.12	.....
Total points gained				37⅞
Per cent increase				58.4

Transport Companies

Aviation Corporation	4⅛	9⅛	7⅛	3⅛
Aviation Corp. of Am.	24⅛	55	42	17⅛
N. A. T.	11	39⅛	23⅞	12⅞
N. Y. R. & B. A. Inc.	8	18	15	7
T. A. T.	6	10⅞	8⅛	2⅛
Western Air Express	22	46⅞	38⅛	16⅛
Average	12.68	30.00	22.66	.....
Total points gained				59⅞
Per cent increase				79.1

Manufacturing and Transport

United Air'ft & Trans.	45⅛	99	70⅛	25⅛
Per cent increase				56.7

Holding Companies

National Aviation.	8⅛	21⅛	17	8⅞
No. American Aviation	9⅛	15⅛	12	2⅛
Average	8.62	18.68	14.50	.....
Total points gain				11⅛
Per cent increase				63.2

Aviation Investment Trusts

Air Investors Inc.	11⅛	24	16⅛	5
Per cent increase				45.4

3 per cent over February. Thus so long as goods are continuing to move freely into distribution we need not fear but that general production will shortly regain its stride—and this, notwithstanding the fact that total production even now is at as high a level as it stood throughout the entire first half of 1926—a record breaking year.

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Bendix Quarterly Report

Net earnings of the Bendix Aviation Corp. for the first three months of this year total $751,681 after all charges, including taxes. There were no earnings included from the Bendix Automotive Air Brake Co., the Bragg-Kleisrath Corp., or the Hydraulic Brake Corp., all of the expenses incident to the acquisition of these companies having been charged off. Vincent Bendix, president of the corporation, also stated that the company had had unusual nonrecurring expense incident to handling the largest brake order in its history, and that the company is employing 20 per cent more producing help at present than at any time since its incorporation.

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Elgin Expects More Business

Henry Boynton, Eastern representative of the aircraft instrument division of the Elgin National Watch Co., states that the Elgin firm is now utilizing one complete wing of its factory in Elgin, Ill., for aircraft instrument manufacture, and that the company now has on hand substantial unfilled orders. Further, he states, the Elgin company confidently expects more business this year in aircraft instruments than in 1929.

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Pioneer Finds Business Good

Charles H. Colvin, president of the Pioneer Instrument Co., a division of the Bendix Aviation Corp., stated that his company's sales last year amounted to $1,350,000, of which approximately 85 per cent were for installation on commercial craft. The company's sales consist entirely of instruments and equipment installed on airplanes. "While the number of airplanes to be manufactured during 1930 would be difficult to estimate," Mr. Colvin said, "we look for a continuance of a very satisfactory volume of business. Prices have been drastically reduced as compared with those prevailing last year, but due to improved facilities and reorganization of manufacturing methods on certain items, we expect to be able to maintain a satisfactory profit ratio."

Stanavo Gets Large Oil Order

NEW YORK (N. Y.)—An order for 100,000 gal. of oil has been received from American Airways, Inc. (The Aviation Corp. subsidiary), by Stanavo Specification Board, states vice-president Maj. E. E. Aldrin.

Sabbath Trouble Laid to Traffic

BALTIMORE (MD.)—It now appears that Sunday pleasure flights for hire from Baltimore County fields will not be prevented, though County Commissioners last week caused the arrest of several operators (AVIATION, May 10, p. 950) in what proved to be a test case of a Sabbath operating law. According to the Commissioners, the reason for the arrests lay in the fact that heavy traffic at the airports had caused bad tie-ups, it being pointed out that persons had missed church on this account. It is now said that a better effort will be made to patrol traffic, thus solving the problem.

Glider License Issuing Rights are Denied N.G.A.

WASHINGTON (D. C.)—Tours, races, records, and gliding were among the subjects discussed at N.A.A. headquarters here in the meeting of the Contest Committee held May 2. Those present were George W. Lewis, vice chairman, Miss Amelia Earhart, C. deF. Chandler, Tom Carroll, Walter Hinton, and Maj. Luke Christopher, secretary. Those represented by proxies were Ray Cooper, Rufus Pilcher, Carl F. Schory, John W. Towers, and Col. Clarence M. Young.

Outstanding in the meeting were decisions rendered on suggestions of the National Glider Association that certain powers be granted the N.G.A. by the F.A.I. for handling glider contests, issuing of licenses, sanctions, etc. After some discussion it was unanimously resolved "that the Contest Committee of the N.A.A. is of the opinion that it is not advisable to accept the proposal of the N.G.A. in delegating to the Contest Committee of the N.G.A. the right to issue glider pilot certificates in the three classes and to sanction glider meets." It was therefore resolved "that the Contest Committee of the N.A.A. should retain for itself all the privileges of the F.A.I. and recommends that the proposal of the N.G.A. not be accepted."

Asked by Alva Sole, president of the D. C. Air Legion, concerning the establishment of a record category for amateur fliers, the Committee expressed itself of the opinion that at the present time such a category was inadvisable.

The deed of gift of the Charles E. Thompson Speed Trophy, carrying with it an endowment fund of $5,000, was accepted. This was submitted by R. S. Livingston, of the Thompson Products Co. The trophy will be competed for in the National Air Races free-for-all event to be run at Chicago.

Report Canada Aero Insurance

MONTREAL (QUE.)—Net aviation insurance premiums written in Canada during 1929 amounted to $204,724, and net losses incurred during the year totaled $69,162.

U. S. Geological Survey Tests Value of Air Maps

WASHINGTON (D. C.)—The future usefulness of air methods for government air mapping is being put to trial by the U. S. Geological Survey during the current field season. Successful results are likely to mean the use of flight photos for quick and accurate results on many jobs where the cost is in line with that of ground methods. From the present outlook, it appears that the relative economy depends on the scale of the completed survey.

There is little question that air work is economical for large scales such as 1:12,000 but there is some doubt as to whether it pay on scales in the magnitude of 1:48,000 or smaller on which basis much of the federal mapping is done. It also is believed that the aerial determination of ground relief, while good over rolling or hilly country, is at a disadvantage over area which either are very flat or very mountainous. The ensuing work is expected to clear up some of these points and to outline more definitely within what limits the airplane can best be used for mapping purposes.

On three of the pending surveys, complete topographic or contour maps will be made by the use of the Aerocartograph machine and other Hugershoff apparatus which the Geological Survey has owned for two years but has not yet put into active service. By the Hugershoff principle, flight photographs are taken vertically. A machine operating on the stereoscopic principle is used to match these pictures and to obtain contours. The elevations and scale are tied in through a ground control network.

This method will be used in completing the maps of the Zion and Bruce Canyon national parks in Utah and for a 15-min. quadrangle near Charlottesville, Va. The latter is considered especially important as a test of the equipment for government purposes.

A base map of northern Michigan also is being made from the air but this will simply be a ground plan without contouring. Flight mapping of the upper Columbia River is contemplated by the Survey.

Purchasing Agents to Meet

CHICAGO (ILL.)—Tuesday, June 17, has been selected as aviation day of the National Association of Purchasing Agents' Convention and Inform-a-Show, to be held here at the Hotel Stevens, June 16-19. The aero meeting will be staged by the Aviation Sub-Division, Transportation Group, and all purchasing agents connected with the aviation industry, whether association members or not, are asked to attend. Information regarding the conference may be obtained from chairman E. Van Vechten, purchasing agent, National Air Transport, Inc., Municipal Airport, Chicago.

Curtiss Marine Race Eligibility Rules Changed

WASHINGTON (D. C.) — Eligibility rules for the planes entered in the eleventh annual Curtiss Marine Trophy Race, to be flown at Anacostia, D. C., May 24, have been changed somewhat from those governing last year's race. The new requirements specify that (1) planes classified as seaplanes must be fitted, without alterations, to receive seaplane floats, (2) no Venturi cowling may be used over engines, (3) planes may be stripped of radio, ordnance and night flying equipment and need carry only enough fuel and oil to give a satisfactory margin for the completion of the race, (4) planes may be especially streamlined, provided that no permanent changes are made, and (5) standard engines, without superchargers, etc., must be used, as in normal operating conditions.

An aerial review of 160 planes from the Lexington, Saratoga and Langley will be staged in conjunction with the Curtiss race. Flying squadrons, composed of eighteen planes each, will show their wares in close formations. The "High Hats," the "Red Rippers," the "Greyhounds" and the "Minute Men" will be among the squardons performing. Expectations are that the "High Hats" will go through their formation with the planes linked together with 50-ft. rope lengths.

Gardner to Replace Williams

Lieut. M. B. Gardner, operations officer at Anacostia, will take the place of Lieut. Al Williams (resigned) in exhibition flying. Additional events will be a divisional exhibit (nine planes) in maneuvres and tactics, parachute jumping by six men from a Navy Ford, and the flying of a Marine section. Attempts are being made by the Anacostia station to work up a section to replace the famous "Sea Hawks," now disbanded. Lieut. A. P. Storrs, III, a member of the "Hawks," is now stationed at Anacostia. The other members of the section, which may fly as an added attraction at the race, are Lieutenant Gardner and Lieut. Frederick M. Trapnell, a member of the Flight Test Section. The Curtiss race will be run over a closed circuit of five laps of 20 mi. each, extending down the Potomac River below Alexandria. Twenty-eight planes of five classifications have been entered.

Offer Ingalls Trophy Again

As a spur to the pilots flying amphibion, torpedo, and training planes—classes regarded as having little chance to win the race—the Ingalls Trophy will be awarded for the second time. This trophy, given by Assistant Secretary of the Navy David S. Ingalls, goes to the pilot of the plane which surpasses or most nearly attains the rated power at which the plane was accepted as a service type.

Maj. H. C. Davidson, Army Air Corps, Glenn L. Martin and Lieut. Col. C. deF. Chandler compose the Contest Committee. The judges are Dr. George W. Lewis, N.A.C.A., A. K. Barta, president of the Aero Club of Washington and Capt. Tom Carrol, former test pilot of the N.A.C.A. Carl Schory is serving as Referee and Chief Timer. Comdr. John H. Towers, Assistant Chief of the Bureau of Aeronautics, again is officiating as chairman of the executive committee.

Second Guggenheim Medal to Dr. Prandtl

NEW YORK (N. Y.)—The second Daniel Guggenheim gold medal for notable achievement in aeronautics has just been awarded to Dr. Ludwig Prandtl, professor at the University of Gottingen, Germany, "for pioneer and creative work in the theory of aerodynamics." Dr. Prandtl is one of the world's most eminent authorities on aerodynamics and other sciences underlying the art of aviation. He is also well known as an investigator and teacher of the laws of mechanics, thermodynamics and the flow of fluids, particularly air and other gases. The first award of the Guggenheim Medal for notable achievement in aeronautics was made to Orville Wright.

The members of the Board which made the award are: American—W. F. Durand, E. P. Warner, Elmer A. Sperry, Arthur Nutt, Howard E. Coffin, Paul G. Zimmermann, E. E. Aldrin, Emory S. Land; Foreign—Griffith Brewer, England, Johann Schuette, Germany, Giulio Costanzi, Italy, Baron Chuzaburo Shiba, Japan (Dr. Rateau, of the Societe Francaise de Navigation Aerienne, died before the balloting).

The Medal was founded in 1927 by the Daniel Guggenheim Fund for the Promotion of Aeronautics, of which Mr. Harry F. Guggenheim, now ambassador to Cuba, was then president. At the annual meeting on May 7 the following officers were elected: president, William B. Stout, representing the Society of Automotive Engineers, president of the Stout Air Service; vice-president, Capt. E. E. Aldrin, Manager, Aviation Department of the Standard Oil Development Co.; secretary and treasurer, Alfred D. Flinn, Director of Engineering Foundation; executive committee, the President, Captain Aldrin, and E. P. Warner, Editor of AVIATION.

Prepare S.A.E. Indiana Meeting

NEW YORK (N.Y.)—Aeronautical exhibits to include the Manly aviation engine from the Smithsonian Institution; the Wright Brothers' early hand-built aero engine, and several Curtiss-Wright power plants will be on view at the 25th anniversary meeting of the Society of Automotive Engineers, to take place at French Lick, Ind., May 25-29. It is expected more than 1,200 automotive engineers and executives, including thirty French engineers representing the Societe des Ingenieurs de L'Automobile, will attend.

Rules for Recognition Of Glider Marks Issued

DETROIT (MICH.) — Correcting the memorandum dated February 13, the National Glider Association has issued a new memorandum concerning regulations for official recognition of record soaring flights. The letter follows:

Pilots engaged in contests and individual record attempts in soaring flight should have their attention emphatically called to the following requirements of the F.A.I., represented in the United States by the National Aeronautic Association.

Pilots applying for official recognition of record flights, should submit sworn statements of official N.G.A. or N.A.A. timers and observers to N.G.A. headquarters. If approved by the Chairman of the N.G.A. Contest Committee, these reports will be forwarded for official action by the Contest Committee of the N.A.A. These statements should be accompanied by photographs of the soarer or sailplane used in the flight and of the pilot, both in duplicate. Extra copies for the N.G.A. will be appreciated.

Barographs must be used. The barograph should be sealed and placed in the glider by the official observer or observers and should be left there until removed by such officials. The seal of the barograph may be broken if absolutely necessary by said observers but in such cases, a sworn complete statement of the circumstances should be a part of the official records. The sealed barograph must be then carried or expressed to the Contest Committee, The National Aeronautic Association, Barr Bldg., Washington, D. C. That body refers it to the Bureau of Standards for calibration and only after receiving the report of the Bureau, will the Committee pass on the case in hand.

F.A.I. record classifications are published on Page 3, Article III, Section 1. The paragraph starting, "For records (b) and (d)" should be disregarded. The rule in this case now is:

"For duration records without return to starting point and for distance records in a straight line, the altitude of the point of landing must *not** be lower than that of the starting point by more than 1 per cent of the distance covered in a straight line between these two points."

The paragraph starting "For records (a), (c) and (f)" should be amended to read "500 m," rather than "1,500 ft." This is slightly in excess of 1,800 ft.

The National Glider Association, Inc.
Donald F. Walker, Mgr.

*The correction

New Mark for Sergievsky

NORTH BEACH (L.I. N.Y.)—Capt. Boris Sergievsky, chief test pilot for Sikorsky Aviation Corp., apparently broke another record on Thursday, May 8, when he ascended to approximately 26,000 ft., or better, carrying a 500 kg. (1,102 lb.) load in an S-38 powered with supercharged Wasps. Official calibration of the barograph must take place before he is credited with having officially erased the old American mark of 22,178 ft., made by Lieut. George R. Henderson, U. S. N., in a Wasp-powered Vought Corsair, on April 14, 1927. However, Captain Sergievsky's ascension did not sufficiently better the present world record of 27,750 ft., made by Fritz Harder, Germany, in a Bristol Jupiter-powered W-34, Junkers seaplane to create a new record of that category. General Electric superchargers, similar to those used on Army planes, were employed by Captain Sergievsky.

BRIEFLY

More than $250,000 in unfilled orders are reported by Boeing Aircraft of Canada, Ltd., Vancouver, B. C.

Van Lear Black, Baltimore publisher who recently completed a London to Tokio flight in a tri-engined Fokker plane, will fly from San Francisco to Baltimore, arriving in the latter city about May 19.

Century Rotary Motor Corp., formerly of Canastota, N. Y., has been moved to Cortland, N. Y.

Material & Equipment Inspection Bureau, with offices at 332 S. Michigan Ave., Chicago, Ill., has been formed to do engineering inspection, purchasing and liquidation service.

Three hundred employees of Pittsburgh Plate Glass Co. at Milwaukee, Wis., were given free airplane rides April 27 through the co-operation of the Association of Commerce and the company, which makes Mimax aircraft finishes. The company operates two planes and has ordered an autogiro.

Curtiss-Wright Flying Service has discontinued operations at What Cheer Airport, Pawtucket, R. I., and will sublet its airport lease.

Opposition to the use of airplanes for newspaper delivery because of their uncertainty was indicated at a meeting of circulation managers of New York newspapers held in Buffalo April 29-30.

Claude General Neon Lights, Ltd., has been organized in London by Claude Neon interest in co-operation with General Electric Co., Ltd., of England, and Aktiengasellschaft fur Elektrizitats-Industrie of Germany.

A glider club has been organized at San Angelo, Tex.

Frank Goldsborough, 19-yr.-old pilot, completed a round-trip flight from New York City to the West Coast on May 11, establishing an unofficial junior record. He started from New York April 28.

Experimental shipments of milk are being made from Springfield to Boston, Mass., by plane.

Air wheel equipment for Model 201 Kinner-powered American Eagle biplane has been approved by the Department of Commerce.

A special Model 80-A tri-engined Boeing Transport is being built with open cockpit for the pilot, and comparison with operation in a closed cockpit will be the subject of a series of tests.

S. C. Breder, vice-president in charge of sales for Bowlus Sailplane Co., San Diego, Calif., is to make a nation-wide sales tour.

Inquiries in regard to W. E. Boeing scholarships have been received from more than 100 schools and colleges.

Only 16 per cent of Boeing plane production went to the Army in 1929, as compared with 50 per cent in 1926.

A sailor who had been swept overboard from a speedboat in Long Island Sound was saved from drowning by the New York City Police plane, which made a landing beside him and took him aboard.

Twenty-five civilian representatives of the aeronautical branch of the Chilean Government are at the Buffalo, N. Y., plant of Curtiss Aeroplane & Motor Co. for training as mechanics and mechanical engineers.

Leon Holly, Fulton, N. Y., will establish a sales agency for American Eagle planes and a flying service in that city.

On May 1, 816 persons were employed at the Boeing Airplane factory, Seattle, Wash.

Several Boeing P-12 pursuit planes have recently been delivered to the Air Corps First Pursuit Group, Detroit, Mich.

Kern County, Calif., has purchased an air ambulance for general use, particularly to serve oil fields at some distance from towns or cities.

New Firms Announced

LOUISIANA AVIATION CORP., Baton Rouge, La.; capital stock, $20,000; by Gordon M. Ronaldson and others.

A. & H. FLYING SERVICE, INC., Henderson, N. C.; capital stock, $100,000; by T. J. Roberts and H. O. Comp.

INTERNATION AIRLINES, INC., Main Street Airport, Houston, Tex.; capital, $100,000; Fain Gillock, pres.

UTICA SKYWAYS, INC., Utica, N. Y.; capital, $25,000; by Merwin L. Todd, Alice A. Todd, G. Clayton Farrell; Pratt & Fowler, 506 U.G.&E. Bldg., Utica, attorneys; to manufacture airplanes and accessories, furnish passenger service, and give instruction.

COURTNEY AERIAL TRANSPORTATION CO., Courtney, Vancouver Island, B. C.; capital, $25,000; to conduct commercial and passenger flying service.

SCHOONMAKER & CHOATE, INC., New York City; capital, 5,000 shares preferred stock of $10 par value, and 100 shares common stock of no par value; by Robert Schoonmaker, Francis Choate, Harold Etgen; Jacobs & Blumensteil, 225 Broadway, New York City, attorneys; to deal in motor vehicles, airplanes, accessories, etc.

BETTIS AERO CORP., Newport, Tenn.; capital, $20,000; by Charles C. McNabb and J. E. Bettis.

Representatives Named

CURTISS-WRIGHT—Jack Bellby, dealer for Marysville and Sacramento, Calif.; Cardiff & Peacock Flying School, Fresno, Calif.

AERONCA—Providence Air Transport, Providence, R. I.

STINSON—Logan Aviation Co., Detroit, Ohio, distributor for Ohio.

WACO—Knoxville Aero Corp., Knoxville, Tenn.

AMERICAN EAGLE—Leon Holly, Fulton, N. Y., sales and service agent.

NEW STANDARD—Texas Airplane Corp., Corpus Christi, Tex.; for Texas.

TRADE TIPS

It has been reported that

Bids received for construction of hangar at Ely Field, Yuma, Ariz., have been rejected, and new bids are called for.

City purchasing agent of Knoxville, Tenn., is taking bids for construction of two hangars at McGhee Tyson Airport, to cost about $18,000.

The municipal airport at Laredo, Tex., will be leased to a commercial firm.

A 24-in. revolving beacon of 2,000,000 cp. and boundary lights are to be installed at Sinton, Tex., airport.

The following are in the market for gliders: Vero Beach Gliding Club, Vero Beach, Fla.; R. G. Wilk, Tampa Glider Club, 412 First National Bank, Tampa, Fla.; T. Kelley, 1704 Grand Central Avenue, Tampa, Fla.; Irwin Yarnell, Jr., Lake Wales, Fla.; C. R. Tydings, Jr., 951 E. Adams, Ocala, Fla.; Brooks Leffingwell, Bradenton, Fla.; Fred Caddell, 620 Laurel, Palotka, Fla.; J. H. Churchill, 4650 21st Ave. S., St. Petersburg, Fla.; T. Napier, Sigma Nu, University of Florida, Gainesville, Fla.

Northwest Air Marine, Stevenson Field, Winnipeg, Manitoba, will soon be in the market for three or four planes.

N.B. Additional information concerning trade possibilities will be found in the column headed "Airport Construction Projects."

Schools and Colleges

UNIVERSITY OF BUFFALO, Buffalo, N. Y., has started its sixth ground school term under the direction of W. Harold Taylor. Classes are held three evenings weekly, with supplementary classes at the municipal airport in co-operation with Colonial Flying Service.

CURTISS-WRIGHT FLYING SCHOOL, Alameda, Calif., is planning a state-wide tour to be made by ten or more student planes. The tour is to last from five to seven days and cover approximately 2,000 mi.

KANSAS AIR SERVICE, INC., is to be the name of a new flying school shortly to be started by H. F. Mitchell at Wichita. Fifteen students are enrolled for instruction.

T. C. RYAN FLYING SCHOOL, San Diego, will hereafter require that transport students have 20 hr. flight time in cabin planes.

CAPE COD GLIDER SCHOOL, South Wellfleet, Mass., established last summer by the American Motorless Aviation Corp., will reopen for its second season on June 1. Ten-day courses in gliding and soaring are offered. During a preliminary period, May 16-June 1, special instruction will be given for licensed airplane pilots. The school reports an enrollment of 250 students. Permanent buildings of camp type have been constructed, and swimming, calisthenics, and other recreational facilities will be part of the school's program.

PERSONNEL

FREDERIC G. COBURN, president of The Aviation Corp., succeeds C. S. REED as president of Fairchild Aviation Corp. Mr. Reed resigned to devote his attention to other interests.

GEORGE A. FUNKHOUSER, formerly secretary and treasurer of Dayton Airplane Engine Co., has been elected president, succeeding R. R. GRANT. T. MILTON HIESTER, vice-president of National Aircraft Products Co., has been elected vice-president, and F. DON WILLIAMS is the new secretary and chief engineer for the Dayton company.

ROBERT PORTER, for the past year general manager and chairman of the board, has been elected president of Kinner Airplane & Motor Corp., succeeding W. B. KINNER, resigned. W. WARDMAN, purchasing agent, has been made secretary-treasurer, succeeding R. E. OLIN.

W. A. PATTERSON, general traffic manager of Boeing System, has resigned.

JAMES W. BORTON, superintendent of Cleveland Aero Repair Depot, of T.A.C., has been elected president of Cleveland Airport Operators' Association.

GEORGE NEWMAN, vice-president of Consolidated Aircraft Corp., has been elected a director of the Kenmore-Tonawanda Board of Trade, covering the area just north of Buffalo, N. Y., where important aircraft developments are taking place.

CHARLES J. GOODFELLOW, formerly general manager for Curtiss-Wright Flying Service, is now sales manager of Peel Glider Boat Corp., College Point, L. I., N. Y.

L. E. TERRILL has been transferred from Kansas City to Dallas, Tex., as traffic representative for Western Air Express. JULIUS KAHN, JR., has been transferred from northern California to Washington, D. C.

ALBERT L. FURTH has resigned from the publicity staff of The Aviation Corp. to cover aeronautical news for *Time*.

CLARENCE MORR has been promoted to the position of sales manager of Firestone Tire & Rubber Co., Akron, Ohio.

GEORGE E. SHAW, former assistant purchasing agent of S.A.T. Division of American Airways, is now purchasing agent for Robertson Division of Universal Division.

J. WARREN SMITH has been named general manager of Northern Airways, Inc., Wausau, Wis.

ROBERT SAND, formerly with Universal, has been appointed traffic manager for the new St. Louis-New Orleans line operated by Robertson Division.

D. H. HOLLOWELL, formerly general sales manager of American Eagle Aircraft Corp., is now manager of Rearwin Airplanes Corp., Kansas City, Mo.

CAPT. JOHN HALLIGAN, JR., commander of the aircraft squadrons, scouting fleet, replaces Rear Admiral WILLIAM H. STANDLEY, who has been given command of destroyer squadrons in the battle fleet.

REAR ADMIRAL JOSEPH M. REEVES has been given command of the aircraft squadrons of the battle fleet, succeeding REAR ADMIRAL HENRY V. BUTLER.

VICTOR EVANS has been appointed chief pilot for Donald Woodward Flying Service, Inc., Buffalo, N. Y., succeeding OTTO ENDERTON, resigned.

KENNETH HATHAWAY, student and transport pilot, has been made chief instructor of the Harvard University Flying Club.

MARK KEARNEY, formerly with Gliders, Inc., has been appointed Detroit traffic manager for Mason & Dixon Airlines.

WILLIAM J. PETERSON has been placed in charge of the new paint and lacquer department of Great Northern Aviation Corp., St. Paul, Minn.

ALBERT PANELLA and PHILIP WEIKERT have been appointed weather observers at Utica (N. Y.) municipal airport.

GENE SCHACKER, formerly with Rapid Aviation, Inc., Council Bluffs, Iowa, is now chief pilot for the Missouri Valley Gas Co. of Omaha.

B. B. DILWORTH has been appointed representative of S.A.T. Division of American Airways at Robert Mueller Airport, Austin, Tex.

WALTER SMITH is manager of Rapid Aviation, Inc., ground school at Omaha, Neb.

Ohio Sheriffs Discuss Air Law Enforcements

COLUMBUS (OHIO.)—Ohio's first air conference of sheriffs and county prosecutors, called by John M. Vorys, State Director of Aeronautics, was held at Port Columbus May 7. Governor Cooper spoke before the group, saying that the state should have an aerial traffic code and that until it does the sheriffs and prosecutors should cooperate fully with Federal officials in the enforcement of Aero Branch traffic regulations.

Aerial laws now on the Ohio statute books and form of procedure were explained by Attorney General Bettman. The relation of the Federal air commerce act to the Ohio law, and an explanation of Federal aeronautical regulations were made by J. S. Marriott, Assistant Chief of the inspection section, Aero Branch, Department of Commerce. These talks were followed by general discussion of air law administration.

Demonstrations of proper and improper flight were made by Curtiss-Wright Flying Service pilots and by Harold R. Neely, an inspector for the Department of Commerce. Those attending the conference were taken aloft for sight-seeing tours over Columbus in planes of the Standard Oil Co., The Firestone Tire & Rubber Co., The Goodyear Tire & Rubber Co., and the Cleveland *News* plane.

AERONAUTICAL CALENDAR

May 27-30	All-New England Air Tour, starting from Springfield Airport, Springfield, Mass.
June 28	Annual R.A.F. Display, Hendon, Eng.
July 20-Aug. 7	International Light Plane Tour, starting from Tempelhof Airport, Berlin, Germany.
July 21	All-America Flying Derby, starting from Detroit, Mich. Sponsored by American Cirrus Engines, Inc., Marysville, Mich.
Aug. 9-24	International Gliding Meet, auspices Rhoen-Rossiten Gesellschaft; the Wasserkuppe, East Prussia, Germany.
Aug. 23-Sept. 1	National Air Races, Chicago, Ill.
	EXPOSITIONS
June 2-7	Northwest Aircraft Exposition, the Coliseum, Minneapolis-St. Paul, Minn. Show Director, Ray Krimm, 601 Wesley Temple Bldg., Minneapolis.
June 28-July 6	Pacific Coast Aeronautical Exposition, Oakland, Calif., Municipal Airport.
July 6	International Transportation Exposition, Warsaw, Poland.
Sept. 6-8	International Aero Exhibition, Stockholm, Sweden.
	MEETINGS AND CONFERENCES
May 19-22	Fourth Annual Technical Aeronautical Meeting, A.S.M.E., Wright Field, Dayton, Ohio.
May 25-29	S.A.E. Twenty-fifth Anniversary Meeting, French Lick, Ind.
June 9-12	Semi-annual meeting, A.S.M.E., Detroit, Mich.
July 3-5	Western States Aeronautical Conference, Medford, Ore.
Aug. 26-28	S.A.E. Aeronautic Meeting, Chicago, Ill.
Sept. 1-6	Fifth International Air Congress, under the auspices of the Royal Aero Club; The Hague, Holland.
	AIRPORT DEDICATIONS
May 26	Muskogee, Okla., Municipal Airport.
May 27	Turners Falls-Greenfield, Mass.
May 30	Delta, Colo., Airport.
May 30-June 1	Dedication and Air Circus, Colusa, Calif., Municipal Airport.
May 30-June 1	Dedication and Air Meet, Bowles Airport, Springfield, Mass.
May 30-June 1	United Airport, Burbank, Calif.
May 29-31	Abilene, Tex., Municipal Airport.
June 7	Los Angeles Airport, Los Angeles, Calif.
June 10	Elgin, Ill., Municipal Airport.
June 20-21	Randolph Field, San Antonio, Tex.
June 21-22	Allentown, Pa., Airport.
June 28-29	Tyler, Tex., Municipal Airport.
July 4	Kelso, Wash., Airport.
Aug. 30-Sept. 1	Williamson Johnson Airport, Duluth, Minn.

Offer Lincolns With Air Wheels

LINCOLN (NEB.)—Lincoln Aircraft Co. announces that the Goodyear Air Wheel equipment is now offered on the Lincoln P.T. line at $133.35 extra.

AIRPORTS AND AIRLINES

Visual Radio Beacon To Be Placed at Bellefonte

WASHINGTON (D. C.)—The visual type of radio beacon, which has been the subject of intensive development for some time by the Bureau of Standards and the Aeronautics Branch, is to be installed at Bellefonte, Pa., for actual test under service conditions. Equipment for the station is about completed and it is expected it will be in place and in operation by the end of this month.

The decision to install this station on a regular airway followed recent extensive flight tests, using the visual installations at College Park, Md., and at Wayne County Airport, Detroit. One of the final tests was a flight between the two carried out with an Aeronautics Branch radio plane, during which it was noted that the beacon beams directed the plane over the same landmarks in both directions.

On the eastbound flight from Detroit the signals from Detroit were followed for 225 mi. This strength of signals was attributed to the fact that the terrain flown over is comparatively flat. The penetrative powers of the beacon lessen with the increase in mountainous characteristics of the terrain. On the flight to Detroit the College Park beam was followed 160 mi. to the vicinity of Uniontown, Pa. Mountains are prevalent over the course flown. On a flight between Philadelphia and College Park at night it was noted that there were no apparent night variations.

Head Phones For Broadcasts

Small filter units which will permit the pilot to use the same receiving set for the reed indicator and for the head phones, necessary for the reception of weather data every 15 min., will be supplied. This unit eliminates the hum in the earphones while the reeds are in operation.

The circular reed box placed on the instrument board of the plane has been developed for a twelve-course system but may be used on a four-course system, inasmuch as all the aural stations now in use are of the latter type. The twelve-course box contains four reeds, one each tuned to frequencies of 86.7, 108.3 and two to 65 cycles. The twelve-course transmitter produces twelve courses spaced at about 30 deg. apart. Each reed has a separate driving electro-magnet, similar to those used in telephone receivers, the windings of which are connected in series to the proper polarity to operate the polarized reeds. The terminals are connected to the receiving set.

Each of the twelve courses are desig-

(Concluded on Page 1012)

Colonial Charges Bus Fares

NEW YORK (N. Y.) — Colonial on May 12 began charging for transportation on its buses connecting the hotels in New York and Boston with the airport terminals of its passenger line. The charge is $0.75. New buses are being placed in service, equipped with radio. Colonial recently withdrew its flight escort system by which an escort conducted a plane party from starting point to destination.

Corporation Formed To Handle Airline Radio

NEW YORK (N. Y.)—Aeronautical Radio, Inc., has been organized to take over the handling of the aviation radio frequencies allotted to air transport companies and it has received the approval of the Federal Radio Commission. The organization is said to represent about 60 per cent of the air transport companies and will take over their radio facilities for operation on a co-operative basis. This has been handled directly by the Radio Commission. Through this new group a request has been made for the exclusive use of a number of high frequency wave lengths. It is reported this has been approved by the Commission.

American Airways and associated companies has agreed to co-operate with the corporation and so has Western Air Express and United. Most of the others have been invited to join. It is not intended that the work of this company will duplicate the services supplied by the Airways Division of the Department of Commerce. The frequencies involved are those which have been allotted from time to time to airline operators on a temporary basis for the use of their own services primarily, but available for any operator flying that same route, if so desired.

Stock in the corporation will be issued to the member lines but not to the public.

At a meeting of the members held at Chicago Monday, May 12, the following officers were elected:

President, Herbert Hoover, Jr., W.A.E.; vice-president, Thorp Hiscock, Boeing; executive vice-president, Paul Goldsborough; secretary-treasurer, H. C. Leuteritz, P.A.A.; chairman board of directors, P. G. Johnson, Boeing.

The organization is capitalized at $50,000 and is incorporated under the laws of Delaware. Stock will be held in proportion to the number of miles flown. Temporary headquarters will be at the Hotel Carlton, Washington, D. C., but will be removed later to the National Press Building. Mr. Goldsborough will be in charge.

Branch to Issue Airline Certificates

New Regulations Made To Aid Safety, Uniformity

WASHINGTON (D. C.) — An important supplement to the Air Commerce Regulations of the Department of Commerce, affecting companies carrying passengers on schedule in interstate commerce, went into effect at midnight May 15. Under the provisions of this supplement no airline operating interstate on schedule may so operate without a Certificate of Authority from the Secretary of Commerce, such authority to be granted only after rigid inspection of the airline in all its phases and its qualification in respect to certain requirements the government has drawn up.

This means that airlines are to be licensed even as aircraft, aircraft engines and airmen are licensed. The general requirements which must be adhered to by the individual lines is described briefly below but the interpretations of these requirements is to be announced later. Pending their receipt, it appears that there may be considerable latitude in requirements demanded from each individual airline. That is, each line must satisfy the government inspectors that it is adequately equipped with the proper machines and personnel to operate over the particular route over which it functions.

Part of Federal Program

However, it is plainly expected that the new arrangement will bring about a certain uniform minimum of operation practices which should cause unprecedented records of safety and reliability in passenger transportation. This step is considered by the Aeronautics Branch to be in accordance with its comprehensive, fundamental program, which means that airways and aids to air navigation have been established and that their use should be required in the interest of safety and reliability.

This action has been spurred on by the regrettable accidents in recent months and is the outgrowth, in many respects, of meetings held with airline operators here in January and February. Approval of the action by a majority of the operators was obtained at these conferences, it is declared, and since then the Branch has been busy drawing up the provisions in detail.

Operators are allowed until midnight of July 15 to file applications for the Certificates of Authority. Upon receipt of this application, a temporary Letter

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Passenger Insurance For Boeing Arranged

SEATTLE (WASH.) — Boeing System passengers now have the benefit of special insurance policies, if they so desire, through an arrangement recently completed with the Travelers Insurance Co., of Hartford, Conn. This policy arrangement is similar to that provided for railroad travellers and is handled in the same way through local traffic agents and field managers of the operating company, such company employes merely acting as the agent for the insurance concern.

A $5,000 policy may be bought for $2. It is good for 24 hr. except when the passenger is delayed unavoidably on the part of the Boeing company, when an extension of 24 hr. is allowed for the completion of the trip by air, rail or stage. If the delay extends beyond this 24-hr. grace period, the passenger must purchase another accident ticket if he wishes the coverage to continue throughout the trip.

The insurance contract allows $5,000 if the insured is killed or loses the sight of both eyes or loses two limbs; $2,500 for the loss of one limb or the sight of one eye; $25 per week for total disability; $20.50 per week for partial disability.

Begin Canadian Federal Base

OTTAWA (ONT.) — Work has been started on the $3,000,000 combination land and seaplane base for the Department of National Defence at Trenton, Ont., about 90 mi. east of Toronto along the shore of Lake Ontario. Removal of trees and grading of the 1,200 acres is well under way and 49 trucks are importing crushed stone for use in later phases of construction. The field will be divided into four units, each having a tile drainage system about 32 mi. long. A government highway passes through the field and this will be eliminated as a hazard by the construction of two tunnels under it, each wide enough to allow the passage of a plane. Four 100x200-ft. steel hangars and two large residence buildings are to be built soon. Hangars and docks will be constructed along the shore for the seaplane operation. It is expected that about 2 yr. will be required to complete the project, according to reports.

Robertson Adds Spur Line

MEMPHIS (TENN.)—Robertson Airplane Service Co., which opened a daily line between St. Louis and New Orleans with a stop at this city on April 27, has added a daily service between here and Hot Springs by way of Little Rock, Ark. A Ryan monoplane is being used. The schedule, as started May 8, is as follows:

Lv. 1:30 p.m.	Memphis	arr.	1:20 p.m.
Lv. 3:15 p.m.	Little Rock	lv.	12 noon
Arr. 3:50 p.m.	Hot Springs	lv.	11:25 a.m.

L.I. Club Has Bad Fire

HICKSVILLE (L. I.) — Fire which started when gasoline spray being used to wash down an engine was ignited by a spark from an electric motor, caused some $50,000 damage at the Long Island Aviation Country Club, located here, recently.

Visual Radio Beacon

(*Continued from page* 1009)

nated by colors, one color being assigned to each pair of beams forming a straight line through the beacon station. The pilot observes the relative vibration of adjacent reeds, of course, hence there is a matter of slight adjustment to the reed box in accordance with the course which he wishes to follow. This adjustment process has been reduced to a comparatively simple operation through the use of the color scheme.

On the face of the box there are three rows of indicators. The top row consists of the faces of the reeds. From left to right, there is a 65-cycle reed, then the 86.7-cycle reed, then the 108.3-cycle reed and another 65-cycle

Showing the face of the reed box as seen by the pilot. The red, yellow and blue arrows point to the lower group (see story); the yellow and green arrows above point to the middle group. The reeds are the two white oblongs just above exact center and opposite the word "yellow."

reed. On the row below that are six small squares showing the six colors used in the system. The squares are in pairs with one above the other as follows: red above black, yellow above green, blue above brown. Down below there is a group of six oblongs of colors, these oblongs being arranged in two vertical sets of three each. The left one, from top to bottom, shows red, then yellow and below that, blue. The right column shows black at the top, then green and at the bottom, brown.

The pilot does not see all these reeds and color spaces at once. Over the face of the box are shutters and the pilot uses the colors to tune in on his course. He has a diagram showing the courses by color radiating from the station to or from which he wishes to fly. He chooses to fly along the yellow beam, let us say, so he moves the upper shutter over until the yellow square in the second row shows. This automatically exposes through the upper half of the shutter the pair of reeds tuned for that course.

However, it makes a difference whether he is flying to or from the transmitting station, since the reeds would be on the opposite side from the beams to which they respond when the direction is reversed. The bottom row has been provided to compensate for this. The lower shutter is moved to right or left until the color of the course, in this case yellow, shows. Of course, the other two colors—in this case red and blue—show also, but they have no meaning. Now, if the pilot is flying along the yellow course toward the beacon, he swings the mounting of the reed box so that "To" on the color chart is right side up. If flying from the station, he swings the mounting until "From" is rightside up.

When flying between two visual radio range beacons the pilot will have his mounting from one and then when he reaches the beam from the other he will swing it around for the "To" position and follow it to his destination.

The process in brief is: 1, Set upper shutter to show color of course to be followed; 2, rotate mounting to show "To" or "From" the station giving the signals; 3, longest reed shows side off course.

Transport Companies Report Traffic Jumps

NEW YORK (N. Y.)—T.A.T.-Maddux Air Lines established a new traffic record for this company during the month of April by carrying a total of 5,164 passengers as compared with approximately 2,500 persons carried during April, 1929, by Maddux Air Lines alone and the previous high mark of approximately 4,500 passengers carried during August, 1929. Passengers carried for the first 3 mo. of 1930 were: January, 1,851; February, 2,736; and March, 4,082. This gives the line a total of 13,833 passengers carried for the first 4 mo. of the year, which are usually the poorest traffic months. According to H. W. Beck, western division traffic manager, T.A.T.-Maddux Air Lines are now operating at better than 90 per cent of capacity loads.

National Parks Airway, operating between Salt Lake and Great Falls, carried 282 paid passengers during the first 4 mo. of this year as compared with 84 in the same period a year ago. The traffic in April was about double that in March.

The five operating units of American Airways, Inc., carried 20,320 passengers during the first 4 mo. of this year as compared with 20,659 passengers for the whole of 1929, the company reports. A gain of 18.9 per cent in the number of passengers carried in April as compared with March was announced also. At the same time revenues mounted 13.2 per cent. American Airways includes Colonial, Universal, Interstate, Embry-Riddle and Southern Air Transport.

Airline Certificates To be Issued

(*Continued from page* 1009)

of Authority may be given to permit the line to operate pending full inspection by the government.

Some of the outstanding points in the new regulations provide as follows:

1. Before a Certificate will be issued to an airline it must meet all the requirements of the Aeronautics Branch.

2. Planes must be fitted with suitable instruments and must be adapted to the particular conditions of the route.

3. There must be a sufficient number of air and ground personnel to handle the operations and they must be particularly fitted for any special conditions involved.

4. Planes and engines must be inspected, overhauled and repaired at intervals to be fixed by the government.

5. All airways must be provided with air navigation facilities deemed necessary by the government.

6. Each flight shall be authorized, delayed, suspended or cancelled by competent officials which in the case of each airline will be designated by the government.

These regulations have been developed by the Aeronautics Branch following a number of conferences with airline operators last winter. Interpretations of the requirements as in process of preparation and will be published later.

"The action of the Department of Commerce in requiring airline operators to obtain Certificates of Authority is another step toward better regulation of air transportation and is one of the most progressive steps yet taken for the development of air transportation along sound lines. . . . All operators should be thankful to the Department for this helpful measure," stated President Frederic G. Coburn, president of The Aviation Corp. and American Airways, Inc., in discussing this regulation with a representative of AVIATION.

Building Catapult for *Europa*

NEW YORK (N. Y.)—It has been announced here that the Heinkel works in Germany is building a catapult for installation on the upper deck of the North German Lloyd lines *Europa* for a ship-to-shore service similar to that operated from the *Bremen*, of the same line. The catapult is similar to the *Bremen* installation with the exception that certain operating parts are to be housed below decks. The plane again will be a Heinkel low-wing monoplane but the seats will be arranged side-by-side rather than in tandem. This feature has been introduced on the advice of the *Bremen* pilot, Von Studnitz, as an important aid in the navigation of the plane and transfer of radio messages between pilot and radio operator. Installation is expected to be completed some time in July during one of the steamship's short stops at her home port.

Official Air Spaces Arranged

WASHINGTON (D. C.)—Air space reservations over very dangerous areas containing high explosives may be certified by the Aeronautics Branch in accordance with a plan announced by a special committee which has been studying the subject. Day markings shall consist of horizontal, chrome-colored letters at least 30 ft. high (the legend, "Hi-X") placed around the perimeter not more than ¼ mi. apart. Floodlights and electric code beacons, or revolving red beacons may be used for night marking. The air space reservations committee recommended that reservations be limited and be established only by Executive Order and in the case of high explosive areas.

Air Mail Traffic Shows Gain in April

WASHINGTON (D. C.) — Air mail traffic increased during April over the volume for the month of March. There was an increase of 46,043 lb. in April over the March figure which in turn was 70,152 lb. over the volume for February. The daily average for April was 25,822 lb. as compared with 24,051 for March. The volume for April a year ago was 508,672 lb. and for April, 1928, it was 171,028 lb. The preliminary figures for the 25 domestic routes for April are as follows:

	Mi.	Pounds Feb.	Mar.	Apr.
Boston-New York.	192	11,399	9,465	11,074
Chicago-St. Louis.	278	4,249	4,211	4,719
Chicago-Dallas....	1,059	29,356	35,794	38,989
Salt Lake-Los Ang.	600	63,811	71,215	72,327
Salt Lake-Pasco...	530	18,672	22,002	23,251
Seattle-Los Ang...	1,141	18,753	20,396	21,659
Chicago-Minn....	503	13,434	19,826	18,876
Cleveland-Pitts...	123	5,948	4,545	5,399
Cheyenne-Pueblo..	199	5,929	6,594	4,635
Cleveland-L'sville.	345	4,613	5,408	6,675
New York-Chicago	718	119,740	132,680	117,121
Chicago-San Fran.	1,932	136,930	155,322	190,521
New York-Atlanta.	763	31,126	34,916	37,572
Albany-Cleveland.	416	4,709	5,068	5,699
Dallas-Galveston..	320	2,876	3,409	3,341
Dallas-Brownsville	529	7,360	7,618	7,225
Atlanta-New Orl's.	483	7,493	8,292	9,292
Chicago-Cincinnati	270	4,553	4,965	6,740
Atlanta-Miami....	736	15,349	13,957	17,341
Great Falls-Salt L.	489	4,644	4,528	4,696
Chicago-Bay City.	712	11,354	14,992	16,686
St. Louis-Omaha..	403	11,420	13,514	14,741
New Orl's-Houston	319	3,934	4,455	3,960
Chicago-Atlanta...	768	7,656	8,507	12,667
Pasco-Seattle.....	449	9,868	13,649	16,185
Total.....	.....	555,176	625,328	671,391

Increase—46,043 lb.

W.A.E. Starts New Line Through Southwest

LOS ANGELES (CALIF.) — Inaugurating Western Air Express' new passenger line to Dallas (an extension of the Los Angeles-El Paso run formerly operated by Standard Air Lines) the first eastbound plane left Los Angeles for Dallas at 4 a.m. on May 4, scheduled to fly the 1,390 mi. in 14 hr., 30 min. The new line gives Western Air Express a total of 15,382 mi. daily. The total route miles for the entire W.A.E. system is now 6,406.

Cities served on the line are Los Angeles, San Diego, El Centro, Yuma, Phoenix, Tuscon, Douglas, El Paso, Midland, Abilene, and Dallas. The new service makes it possible for a passenger to fly from Dallas to San Francisco — almost 1,800 mi. — in one day, or from Mexico City to Los Angeles in 33 hr. and to San Francisco in 36 hr. As soon as the route between El Paso and Dallas is lighted it is planned to leave Los Angeles at a later hour in the morning, for the convenience of patrons.

Other W.A.E. announcements include the introduction of the Fokker F-32's on both of the Los Angeles-San Francisco daily schedules instead of the single round trip per day as previously. Under the new schedule the F-32's will leave Los Angeles at 8:50 a.m. and 4 p.m., and will leave San Francisco at 9:10 a.m. and 4:10 p.m., daily. A rate cut has been announced on the Los Angeles-Salt Lake City route, the fare having been reduced $15 from $60.

Airline in N. E. To Reach More Cities

SPRINGFIELD (MASS.) — The passenger service which has been in operation between Bridgeport and Albany via Hartford and this city for a number of weeks, has been expanded under a reorganization of the company—New England and Western Air Transportation Corp.—to include Boston and New York. This is the first major venture in passenger air transportation under strictly New England auspices.

Local financial support of the company has made possible this service which will be in the nature of a ferry line.

The fare from this city to either Albany or Boston is $6; to New York is $8.

New Schedule on N.E. Passenger Airline

Read Down				Read Up	
Lv. 8 a.m.	1:30 p.m.	Springfield	Arr.	10:55 a.m.	5:55 p.m
Arr. 8:50 a.m.	2:30 p.m.	Boston	Lv.	10 a.m.	5 p.m.
Lv. 11:15 a.m.		Springfield	Arr.	1:20 p.m.	
Arr 12:10 p.m.		Albany	Lv.	12:30 p.m.	
Lv. 8 a.m.	1:40 p.m.	Springfield	Arr.	11:15 a.m.	6 p.m.
8:30 a.m.		Hartford		10:55	
9:05 a.m.		Bridgeport		10.20	
Arr. 9:30 a.m.	3:10 p.m.	New York (Grand Central Air Terminal, Jackson Heights)	Lv.	9:45	4:30 p.m

AIRPORT CONSTRUCTION PROJECTS

West

THE CURTISS-WRIGHT Airport at Alameda, Calif., reports several improvements in progress. Among these is the dredging of sand from the Oakland-Alameda Estuary to enlarge the area of the port which will be 343 acres when this process is complete. Bids are being received for the yacht harbor and seaplane base to be developed at the port. A new surface oiling system has been put in service, and the construction of the first of a series of steel hangars, a central power house, installation of landing lights, and the provision of parking space for 1,000 cars are projected.

It is reported in Litchfield, Ariz., that P. W. Litchfield, president of the Goodyear-Zeppelin Co., will establish a landing field on his ranch there.

At the Springfield (Ore.) Airport, the Standard Oil Co. is installing an airplane service station to cost about $2,000.

East

Sketches for the proposed hangar for N.A.T. at Newark (N. J.) Airport are reported to have been approved by the manager of the port. According to present plans, the hangar will be 120 ft. square, will have a leanto on one side, and the foundations for a leanto on the other side.

The Buffalo Municipal Airport Advisory Board has authorized the work of reducing the smokestack at the port from 150 to 56 ft. in the interest of safety. The Board is soon to make public a 4-yr. development plan for the airport.

The Albany Board of Contract and Supply has awarded a contract for lengthening and widening of runways at the Albany Municipal Airport to G. C. Collins for the sum of $11,583.75.

Central

The St. Louis Board of Public Service is reported to be completing plans for a $75,000 hangar and leanto to be erected at Natural Bridge and Bridgeton Station Rds., for the National Guard. The hangar will measure 100x160 ft., and the leanto, 20x160 ft.

The municipal airport at Elgin, Ill., is having beacon and floodlights installed. This 173-acre field, for which $20,000 was raised by public subscription, will be formally dedicated on June 10.

The 64x100-ft. hangar at Kewanee (Ill.) Airport is reported to be practically finished, and lighting equipment is being installed.

South

Work on leveling and equipping Palm Park Field, South Jacksonville, Fla., is about to begin. The port fronts on the river and will accommodate both land and sea planes. Permission has been request from the War Department for bulkheading certain sections along the river.

The Dyersburg (Tenn.) Airport is to be improved in accordance with an agrement between the City Council and the State Aeronautical Commission. Additional area will be leased, giving the field a total of 50 acres. Brush will be removed, and a 2,000-ft. east-west runway graded.

The Air Corps hangar at Fort McPherson is to be moved to Candler Field, Atlanta. The Fulton County Commission has appropriated $5,000 to cover expense of moving and the construction of a concrete floor and a 150x675-ft. apron for the hangar.

It is reported that 30 acres near Rogers, Ark., have been leased to the Mid-Continent Air Express of Hutchinson, Kan., which will establish an airport and aviation school there.

The Marshalltown (La.) Chamber of Commerce has taken a 2-yr. lease on a field four miles from the city, and is preparing to erect a hangar and provide oil and gas service there.

Opening of the Kirbyville (Tex.) Airport will be held in the near future when the removing of obstructions and laying out of runways is complete.

Contract for a 78x160 ft. hangar at Meacham Field, Fort Worth, has been awarded to Quisle & Andrews of Fort Worth.

The Aberdeen (Miss.) Chamber of Commerce plans construction of an airport, with hangars, repair shop, and other field units, to cost about $50,000.

Contract for a new hangar at the Hopewell (Va.) Municipal airport has been awarded to the Karlstrommer Construction Co.

The installation of a lighting system at the Ogden (Utah) Airport is reported to be complete.

A new 200-acre port has been established at Texas City, Tex., and one half of the site has been developed.

The Jasper (Tex.) landing field will shortly be leveled and have obstructions removed.

The City Commission of Ballinger, Tex., has leased a 40-acre tract to be used for an airport.

At Centex (Tex.) Airport, an all-metal hangar, 120x100 ft., is being built.

At Candler Field, Atlanta, Eastern Air Transport, will shortly begin work on a $25,000 airplane repair shop which will be equipped for complete rebuilding of planes and engines.

Mills Field to be Developed

SAN FRANCISCO (CALIF.)—Purchase of Mills Field by the city for development as a municipal airport was made possible recently through a decision of the State Supreme Court. The court action arose over the question of whether or not the proposed acquisition of the tract in ten annual installments of $105,000 each would mean the city became obligated to pay the entire amount for the land. In the event of such obligation existing a violation of the city charter would have taken place. The court ruled that the city is obligated only to pay the annual installments. The tract includes 1,100 acres.

Neon and Airway Lights are Compared

WASHINGTON (D. C.)Visual tests of the comparative effectiveness in fog of the ordinary airway beacon and a neon beacon are now being conducted at the Bureau of Standards, following laboratory tests which have been going on for some time. Since the time the lights were mounted on one of the Standards buildings for observation from the ground and from planes there have been very few foggy nights in which to note their effect.

The present tests differ from those conducted at Moody Point—which were concerned only with the comparison of two kinds of red lights, a neon and an incandescent lamp having a red filter—in that they are expected definitely to indicate the relative value of the neon and the ordinary beacon under practical working conditions.

Both advantages and disadvantages are ascribed to the characteristic color of the neon lights. In a closely settled country air routes and ports marked with the red lights may be more easily distinguished, it has been said. One German route, over which the Luft Hansa flies, is illuminated by neons placed at 6-mi. intervals. Tempelhof field at Berlin has been lighted by neons for several years. Red, however, has been made the danger light, observers point out, and its use for airway lighting would necessitate a change in the whole lighting system. Moreover, reflectors to direct the light into one beam can not be placed around the neon lamp because of its size. A question raised in connection with the neon lamps, and which may be affected by the present tests, is whether the concentration of light into one beam is more effective for aeronautical purposes than a uniformly distributed light.

Northwest Opens Service to Omaha

MINNEAPOLIS (MINN.)—Passenger service between the Twin Cities and Omaha by way of Sioux City, Ia., was inaugurated May 8 by Northwest Airways, Inc. The line operates for the present on a weekly basis, making the trip each way on Thursdays, but it is planned to start daily service early in June.

Southbound			Northbound
8:45 a.m. lv.	St. Paul	ar.	6:30 p.m.
8:55	Minneapolis		6:20
11:20	Sioux City		4:00
12:05 p.m. ar.	Omaha	lv.	3:10 p.m.

Fare between the Twin Cities and Omaha is $25 and between the Twin Cities and Sioux City $20. Seven-place Hamiltons powered with Hornets are used. The planes connect at Omaha with the Boeing Chicago-San Francisco line, giving 24 hr. service from the Twin Cities to California. Rapid Air Lines service between Omaha and Kansas City also connects there, giving about 5-hr. service between the Twin Cities and Kansas City.

Loeing amphibion being beached on "button" float at San Francisco

Airway Briefs

A 350-acre tract which may be reached in 4 min. from the center of Dallas, Tex., is being considered as a site for a new municipal airport. The plot has been offered to the city on a 10-yr. free lease, or for $1,000 per acre.

Sky View Lines, Inc., subsidiary of Stout D. & C. Air Lines, Inc., is planning to establish a Pittsburgh-Toronto passenger service, by way of Buffalo, according to an announcement by President T. C. Knight. The company now operates three tri-engined Fords for sightseeing trips.

Curtiss-Wright Flying Service will open passenger service between Plattsburgh, N. Y., and Canada about May 20. Seaplanes will be used.

More than $7,000,000 has been appropriated for improvement of airways, photographic surveys, and similar work this year by the Canadian Government.

Bucyrus Airways, of Bucyrus, Ohio, has acquired control of the municipal airport at Marion, Ohio, and will operate a flying school there.

Contract is to be let for carrying mail in amphibion planes from Oakland to San Francisco, and the Oakland Airport will continue to be used as a terminal for air mail operations for the San Francisco district.

Easter Air Express was scheduled to extend its New York-Providence line to Boston, beginning May 15. The company also plans an extension to Washington, D. C., via Philadelphia.

Proposals have been made for creattion of island airport on the mud flats south of Governors Island in New York Harbor, with subway service to Manhattan and Brooklyn.

Thompson Aeronautical Corp. has leased the A. S. & T. hangar at Chicago Municipal Airport. The company has recently purchased three drums of Sohio aviation Diesel engine fuel for use on the Diesel-engined planes which are soon to be put in service.

Cromwell Airlines, Inc., San Angelo, Tex., has inaugurated daily passenger service between San Antonio and San Angelo, via Fort Worth and Dallas.

Supreme Court of New Jersey has upheld the action of Jersey City in leasing Droyer's Point airport to Jersey City Airport, Inc., for 25 yr. at a total rental of $320,000.

Wedell-Williams Air Service has ordered two Lockheed Vegas for use on an extension of the company's Shreveport-New Orleans line to Fort Worth.

A telephone system enabling the pilot to describe points over which the plane passes to passengers has been installed on S.A.T. planes. Passengers are also supplied with strip maps of the route followed.

Thompson Aeronautical Corp. is considering establishment of a special service between Detroit, Kelley's and Pelee Islands, and Cleveland, to supplement the regular Detroit - Cleveland service.

T.A.C. pilots are being given blind flying instruction at Kalamazoo, Mich.

Lazenby Flying Service, Inc., has been formed at Chattanooga, Tenn, to operate from Lovell Field.

Northwest Airways, Inc., has substituted its tri-engined Ford plane for the Hamilton plane on the afternoon run between the Twin Cities and Chicago and vice-versa, due to heavier afternoon traffic.

Ohio Air Transport, Inc., Youngstown, Ohio, is planing to establish a daily passenger line between that city and Columbus, with a fare of $22 for the round trip.

Harry Huking, Boeing mail pilot and president of National Air Pilots Association, has completed 10 yr. of air mail flying, having 6,000 hr. in the air, and has not had an accident during the last 500,000 mi.

Eberts Field, Lonoke, Ark., which has not been used since the World war, is to be reconditioned and put into service again. It comprises 160 acres.

Northwest Air Marine is the name of a new company formed by merger of Northwestern Airways, Ltd., and Aero Marine Co., of Winnipeg.

Yellow Air Cab Co., Wichita, is planning to establish a combination air and land taxi service which will take passengers from home or office to any destination at a price of $0.10 per air mile.

McMullen Airport, Gaylord, Mich., dedicated recently, has been donated to the Naval Reserve for training purposes by Frederick Van de Water Saunders, Inc.

A Government weather bureau was opened at Port Columbus May 7, with Arnold E. McKenzie in charge.

Efforts are being made to have a dirigible mooring mast erected near Chicago before the National Air Races, when the Los Angeles is expected to visit the city.

Air Ferries Employing "Button" Landing Float

SAN FRANCISCO (CALIF.) — A semi-circular "button" 100 ft. wide has been placed in service at the San Francisco terminal of Air Ferries, Ltd., for use of their amphibions. The construction of the float is rigid, with a smooth, rounded top which slopes gradually into the water. The "floating island" idea is carried to the point of having a real sand surface to keep the planes from skidding. It is a rigid, half circular float, supported by a pontoon and fitted with an overhang platform. The pontoon is divided for water ballast to regulate trim and depth. The surface is a variable curve for the purpose of breaking rough water and giving maximum freeboard.

When the amphibions alight on the water, they unfold their landing gear and climb out of the water onto the button under their own power. They approach from any direction without the help of landing crews, and when they are ready to take off, they roll down the incline into the water, pull up their wheels and take off. More than 85 landings are made on it daily by the five planes in the San Francisco-Oakland and San Francisco-Vallejo (Calif.) services of the company.

The new landing device was developed jointly by B. L. Haviside, of the noted San Francisco maritime family, and Joseph J. Tynan, Jr., president of Air Ferries, Ltd., after 4 mo. experiment. It was built at the C. L. Arques shipyard in Sausalito at a cost of $10,000. Principles involved are in the hands of patent attorneys for coverage.

It is of interest to note that experiments showed that a complete circular float, rotated slowly, will divert the wave, kill the hollow, and make the approach of the planes easy even in a high sea. This would indicate that such a seadrome of suitable size could be commercially useful in mid-ocean. Along the rim are four solid ballast pockets to further regulate the depth. There are eighteen buoyancy tanks installed at the water line to correct any tendency of the float to be too lively. The tonnage of the float is 100 tons, and it extends 4½ ft. under water. It is built of creosoted douglas fir. The float is moored by a cable from the king post to keelsons leading to the rim, and then to anchorage. Dolphins are used for this anchorage but regular ship anchors could be used if desired.

FOREIGN ACTIVITIES

Italy Organizes Light Plane Tour Aug. 25-31

ROME (ITALY)—A light plane tour of Italy will be held Aug. 25-31, under the sponsorship of the Royal Italian Aero Club and *Il Popolo d'Italia.* It will be open to members of the R.A.C.I and of other aero clubs affiliated with the F.A.I. who hold F.A.I. contest licenses. Planes are limited to a weight empty of 880 lb., with a tolerance of twenty per cent, giving a possible maximum gross weight of 1,056 lb. Tests of takeoff and other qualities will be held Aug. 20-24, and will count in the final rating. The rules and regulations of the tour are similar to those of the International Light Plane Tour which starts from Berlin July 20, and it is admitted that the Italian tour has been organized largely as a result of the decision of the Italian Club not to participate in this year's International Tour, following a dispute over last year's decision.

Prizes totalling about $15,750 are offered, with $5,240 for first place, and correspondingly smaller awards down to $105 for contestants placing between 21st and 25th. The tour will be made in four stages, on the following schedule: Aug. 25, Rome-Naples-Bari-Brindisi-Foggia-Pescara-Fermo-Ancona-Fano-Rimini; Aug. 27, Rimini-Florence - Pavullo - Bologna - Ravenna-Ferrara - Pomposa - Padova - Trieste - Postumia-Gorizia-Udine-Venice; Aug. 29, Venice - Vicenza - Trent - Bolzano - Verona - Brescia - Bergamo - Milan - Vercelli-Aosta-Turin; Aug. 31, Turin (Mirafiori) - Allessandria - Parma - Sarsana-Pisa-Cecina-Siena-Campiglia-Marittima - Grosseto - Rome (Littorio). The total distance is about 2,100 mi., with the legs varying from 385 mi. (Venice-Turin) to 690 mi. (Rome-Rimini). Stops at all the intermediate points mentioned are compulsory.

Avro Builds New Trainer

LONDON (ENGLAND)—A. V. Roe & Co., Ltd., has just introduced a new Avro trainer, two-place open biplane with Armstrong-Siddeley Mongoose 150 hp. or Lynx 220 hp. engine. The wings have considerable stagger, and are not fitted with slots. Fuselage is of welded steel tube construction, wire braced. Semi-shrouded Frise ailerons are fitted. Split-type oleo landing gear, with about 8 in. travel, and an appearance of unusual strength, is used. Special attention has been devoted to the problem of concealing incidental parts such as piping, voice-tubes, cables, etc., and still making them easily accessible when adjustments are necessary.

British Owners Complete Tour

HESTON (ENGLAND) — Most of the twenty British private plane owners who participated in the European tour organized by Nigel Norman (AVIATION, April 19) arrived here April 27, ten days after the start. Flt. Lieut. R. L. R. Atcherley and H. Peake, in a Blackburn Bluebird, completed the trip two days ahead of the rest, and a number of others who did not make the full journey arrived at intervals during the week. Only two forced landings were made, and neither resulted in any damage. The tourists were entertained along the way by the Aero Clubs of Germany, Czechoslovakia and Holland, as well as other local organizations, and they reported that the trip was a complete success. Among the cities visited were Brussels, Frankfort, Friedrichshafen, Munich, Salzburg, Vienna, Prague, Dresden, Berlin, Amsterdam, and Ostend.

Italy Votes Increase In Civil Aviation Budget

ROME (ITALY)—The total amount of the Italian aviation budget for 1930-31 as passed by Parliament is $37,500,000, of which about $4,150,000 is for civil aviation. According to the report of the U. S. Department of Commerce attaché, the total increase over the previous year is $940,000, while the increase in the budget for civil aviation is $907,500, the military budget remaining approximately the same. Under the new appropriation, subsidies for transport lines will be $3,900,000; $105,000 will be awarded for competitions, flying clubs, etc., $26,000 for civil airports, and $16,000 for meteorological services.

Figures for the 4 yr. of operation of subsidized transport lines show an increase of from 2,375 mi. to 8,250 mi., and the number of miles flown during a year has increased from 325,000 to 1,830,000, in 1926 and 1929, respectively. Only one passenger has been killed during all the operations, and in 1929 a regularity of service of 97.97 per cent was maintained. There are now eighteen routes being flown, and recent considerable reductions in rates are expected to result in increased business.

German Girl Claims Altitude Mark

BERLIN (GERMANY)—A new altitude record for planes under 280 kg. (615 lb.) is claimed by Miss Margaret Fusbaliu, who recently attained a height of 16,000 ft. in a Klemm monoplane powered with a 40 hp. Salmson engine. The previous record of 13,000 ft. was made last October by pilots Zwirko and Koegan in a B.W.D.2, also using the 40 hp. Salmson engine.

Announce British 1929 Export Figures

LONDON (ENGLAND) — Striking increases in exports of British planes and engines in 1929 as compared with previous years are shown in figures recently published here. The United States was the largest purchaser among foreign countries, with total orders amounting to $575,000. Chile, Bolivia, and the Argentine all bought more than $200,000 worth of complete planes, while Holland took $290,000 worth of British engines, and U.S.S.R. took $175,000 worth. Among British Dominions, Australia was the largest purchaser, taking planes and engines with a total value of $1,150,000. British India was next with $875,000, and Canada third with $780,000. The total value of British aviation exports for the past four years is given below:

	1926	1927	1928	1929
Airplanes..	$405,000	$260,000	$640,000	$4,050,000
Engines...	620,000	330,000	295,000	2,600,000
Parts.....	360,000	410,000	700,000	4,130,000
Totals..	1,385,000	1,000,000	1,635,000	10,780,000

India Has 49 Landing Fields

CALCUTTA (INDIA)—Landing fields available for use of civil aircraft in India now total 49, according to reports received by U. S. Department of Commerce representative. No housing facilities are available at these fields, and gasoline, oil, and stores may be obtained only at the six Government civil airports and the three R.A.F. airports. The following areas in India are prohibited to aircraft: areas occupied by oil installations in Bombay and Karachi; area within a radius of 1 mi. from the Towers of Silence, Bombay; administered districts and political agencies in the northwest frontier Protectorate; areas north of 26 deg. 2 min. latitude in Baluchistan.

Cut Time for England-India Mail

LONDON (ENGLAND)—On the newly adopted summer schedule for India air mail, letters may be received at the General Post Office here until 6 a.m. Saturdays. They are delivered in Alexandria (Egypt) Monday evening; at Bagdad Tuesday evening; at Karachi Friday afternoon; at Delhi Saturday evening. In the reverse direction, mail will leave Delhi Monday evening and arrive at Croydon a week later. This schedule is considerably faster than that which has been in effect through the winter, and somewhat faster than last summer's schedule.

Foreign Briefs

The four-passenger non-rigid airship A. D. 1, built by Airship Development Co., and powered with A.B.C. Hornet engine, has received a British Airworthiness certificate, and is undergoing extensive tests.

Metal Propellers, Ltd., is building hollow steel propellers for light planes, made up of laminated sections in S.3 grade. The Cirrus model weighs only 23½ lb. with hub.

National Flying Service has opened a booking office for aerial taxis in Trafalgar Square, London.

The King's Cup Race, open to civil aircraft built in the British Empire, will be held this year on July 5, over a 750-mi. course. In addition to the cup, Lord Wakefield has offered a $2,500 prize.

On its recent visit to England, the Graf Zeppelin landed on the ground to discharge passengers, since the Cardington mooring mast was occupied by R.100.

It was reported in Parliament recently that the total cost of design, construction, power plant, overhead, shed and flight charges, repairs, modifications and maintenance of R.101, to March 31, 1930, was about $3,000,000.

The cost of designing, building and maintaining Supermarine and Gloster Schneider Trophy racers and engines was about $1,150,000 to April 15.

The Royal Air Force now operates schools at Netheravon, Digby, Grantham, Sealand, and Abu Sueir (Egypt). During 1929, 169 short service pilots were qualified.

A. Comte, of Switzerland has recently completed the A. C. 3, a transport or military monoplane with two 600 hp. Hispano-Suiza engines mounted in tandem above the wing. It will carry two tons of bombs or fifteen passengers with a duration of about 1,300 mi.

Junkers is experimenting with a lateral shaft propeller drive to run propellers placed under each wing from a central engine.

Brooklands Aero Club, successor to the famous Brooklands Flying School, has begun operations.

Thirty Italian military pilots are undergoing special training at Orbetello naval air base, of whom twelve will be chosen to fly the twelve Savoia-Marchetti S.55 seaplanes which are expected to cross the Atlantic next fall.

Gyorgy Endresz and Sandor Magyar, Hungarian pilots, are on their way to Detroit, from where they will attempt a non-stop flight to Budapest in the plane "Justice for Hungary," in an effort to capture the prize offered by Lord Rothermere.

Corporation Aeronautica de Transportes has been awarded the contract to carry mail between Tampico, Mexico, and Laredo, Tex. New airports now being developed on C.A.T. lines are at Leon, El Salto, and Parras. The company is being reorganized as a result of the death of president Eduardo Mead, and the San Antonio-San Luis Potosi line has been temporarily suspended. It is reported, however, that company operations in March were 27 per cent greater than in February.

Col. Samual C. Rojas, former Mexican military attache at Washington, has assumed directorship of the School of Applied Aeronautics, Mexico City. He relieves Col. Carlos C. Breton, who has been appointed commander of the naval seaplane suadron in the Gulf of Mexico.

On the Vera Cruz-Merida-Yucatan route of Pan American Airways, planes are being operated with all-Mexican crews.

During April, 728 paid passengers and 7,320 lb. of mail were carried by planes making their base at Mexico City airport, showing a considerable increase over the previous month.

Edward Frame is making arrangements for establishment of a commercial aviation school in Guadalajara, Jalisco, Mexico.

Successful tests of a new 500-580 hp. nine-cylinder radial engine have recently been made by the Siemens Co., Berlin. It weighs only 881 lb.

There were 21,677 arrivals or departures at Tempelhof airport during 1929, as compared with 20,799 the previous year. Number of passengers carried increased from 41,214 to 42,440. There was a slight decrease in mail and express.

Avions Morane-Saulnier, recently licensed to manufacture De Havilland Moth planes in France, is offering as a premium with every Moth sold a reduction of about $200 in the price of training necessary to secure a first class touring pilot's license.

Aeroplanes Henry Potez is testing a new two-passenger military plane powered with a 500 hp. watercooled Hispano-Suiza engine. It is a parasol type monoplane of steel and duralumin construction.

The town council of Deauville, France, has recently voted funds for construction of a 200-acre airport, and construction will begin immediately.

Dutch Naval Air Station at Sourabaya will have 40 flying boats as soon as a number of Dornier Wals now under construction are completed. They are built by licensees, Avialonda Works of Papendrecht, Holland. The Sourabaya base is also to have six Fokker pursuit planes and five Fokker bombing planes.

Plans for inaugurating a Russian airline between Moscow and Vladivostok are said to have been postponed until 1931.

Miss Amy Johnson, who is flying from London to Australia, made a forced landing as a result of a sandstorm in Syria, but was able to continue without assistance. When last reported, she was ahead of the time made by Bert Hinkler, who holds the record for the journey.

Chinese Plan Important Aviation Developments

NANKING (CHINA)—Plans for extensive development of Chinese aviation are now under way. An air mail service between Mukden and Tientsin is to be inaugurated during this month, and other routes are being considered, under the direction of Capt. Liu-pei-chuan, commander of the Tenth Aviation Corps. These are: Nanking-Hengchow-Yunnan; Nanking-Shanghai-Canton; Canton - Hankow; Nanking-Canton. It is also reported that Gen. Chang Hseuh-liang is planning to develop a strong air force for the army at Mukden, using French instructors. This is nominally in co-operation with the Nationalist Government here, but is interpreted as indicating that General Hseuh-liang is jealous of General Chang Kai-Shek's greatly superior air force.

Plans for extension of the Berlin-Moscow line to China have already been announced by Luft Hansa, and the company has received an air mail contract from the Chinese Government, so the service will be inaugurated as soon as the necessary arrangements are made with Russia. The Russian Moscow-Irkutsk line would probably form an intermediate link. This service as well as those in the interior of China are urgently needed, since in many sections banditry and local tariff charges make the transport of mail, passengers and freight expensive and precarious as well as slow.

The Nanking Government has recently imported 32 Junkers planes from Germany. Of these, 24 are training planes for military instruction, seven are seaplanes, and one is a freight carrier. Ten American Ryans have been sold at Hankow and Canton, and four Waco machines have also been sold at the latter city. Nine British Moths have been sold at Hankow and Nanking. It is pointed out that service must be supplied with planes, as a large order was recently cancelled by a firm in the interior following the crash of the first plane delivered, due to faulty assembly by Chinese mechanics.

Yucatan to Build Airports

MEXICO CITY (MEXICO)—Airports and landing fields are to be constructed in several parts of Yucatan, according to a recent statement by Gov. Bartolome G. Correa. The State Government has appropriated funds for supplying blasting powder and other equipment for conditioning fields, while local labor unions have agreed to provide workers for airport construction at half pay. The rest of the cost of labor will be divided between the State and Municipal Governments. The State Government has also provided materials and labor for painting air-markers in conspicuous places in all cities and towns. A twin-engined Sikorsky has just been purchased for coast patrol, to be used largely in combating smugglers.

WHAT OUR *Readers Say*

Smith vs. N. E. Aircraft Co.

TO THE EDITOR:

The case of Smith et al. vs. New England Aircraft Company, Inc., et al., decided March 4, 1930, by the Supreme Court of Massachusetts, is so generally considered as of unique importance among those interested in the law in relation to aeronautics, that I think that your readers may be interested in a somewhat more detailed comment on the case than that which appears in the March 15, 1930, issue of AVIATION.

In the case in question the plaintiffs, the owners of a large country estate adjoining Worcester Airport, sought to enjoin the defendants from flying over their land in such manner as to constitute a trespass and nuisance, and sought further to enjoin certain of the defendants from using the airport as a base for such flying.

Certain facts peculiar to the case are of importance in considering the effect of the decision of the Court. In the first place, the plaintiffs' property consisted of a tract of approximately 270 acres upon which were erected a large residence and several out-buildings. Except for a lawn and garden near the main building, and one or two small meadows, the tract was covered with brush and woods. The flights of the defendants usually took place over the wooden portion of the tract, and except when taking off and landing, were made at a height of 500 feet or more, in which particular they complied with the requirements of the then existing State and Federal Regulations governing the operation of aircraft. There was no evidence that any actual harm had been brought to the landowners by the flights in question nor that there had been any interference with any valuable use to which their land was capable of being put.

On the contrary, the facts showed that, except when necessary because of winds, the defendants had endeavored, so far as practicable, to refrain from flying within immediate proximity to the plaintiffs' house and buildings, even at high altitudes. In other words, the case was presented solely on the ground of trespass, and the nuisance resulting from its continuance.

The plaintiffs produced evidence that, in making take-offs and landings, the defendants flew over the tract of land in question at altitudes of 100 feet or less, and they contended that such flights constituted trespasses even though flights other than those made in the course of taking off and landing, might be held to be authorized by the Federal and State Statutes governing the use of the upper air. They contended that the test of the scope of possible trespass should be limited by no more than the scope of possible effective possession, that it was not decisive that they did not, at the time of asking for an injunction, make that possible effective possession a realized occupation, and that, therefore, there was an invasion of their property rights from the standpoint of future use.

The Court held, in refusing an injunction, that the facts disclosed did not constitute such nuisance as would warrant or require injunctive relief, since the injury to and the interference with the use of the plaintiffs' property was slight and theoretical.

By far the most important part of Justice Rugg's opinion in this case, in so far as the decision may affect future cases, is that part dealing with the question of the trespasses committed by aircraft in flying over the plaintiffs' land at altitudes of 100 feet in making take-offs and landings. *Such flights were definitely held to be trespasses.*

Courts are impersonal "machines of justice" in theory only, and the decision arrived at in this proceeding is the decision of a tribunal interested, and properly interested, in the reasonable advancement of aeronautics. Certainly it would have been possible for the court to have employed the same line of reasoning which it did employ and, at the same time, to have granted the injunction asked for. The opinion finds, in no uncertain terms, that the acts complained of constitute trespasses but the court refuses to enjoin these trespasses, because they are committed upon a part of the land located at a distance from the dwelling house and put to no use which can be harmed by the flights. A well established doctrine of the law of trespass is that which states that repeated acts of trespass, although the damage for each trespass be but nominal, will entitle the aggrieved party to an injunction. In fact, the equitable doctrine of restraint by injunction grew up through the fact that continuing trespasses which, in each instance, cause nominal damages only, cannot be compensated by the payment of money damages.

From the standpoint of the layman the granting of an injunction in this case would have gone a long way toward setting up a principle which once well established, would have put an end to flying, at least, to flying in places where the landing fields or airports were of such restricted size that it was necessary to glide into and climb out of them over the property of others.

It is hardly to be expected that Judge Rugg's decision in this case will be followed generally, except in so far as other cases may approach this particular case in their facts. Indeed, the case in question will, perhaps, be more valuable to those seeking injunctions than those seeking to avoid them. However, the case is of the greatest possible interest from the standpoint of the lawyer, because it represents a modification of an existing common law doctrine, a modification brought about through a new subject in the law, upon which the eyes of legislatures and courts must focus more and more as that subject develops. The law in relation to aeronautics is still in a most formative stage and questions undreamed of are yet to be decided. Those interested in the development of a branch of the law as peculiar to aeronautics, as is that branch of the law, known as Admiralty Law, to maritime matters, will await with interest future decisions as inclusive and as well considered as that in the instant case, and, in this connection, it is interesting to bear in mind that many of the points involved in the Worcester Airport case are now before the United States District Court for the Eastern District of Ohio, in a Bill in Equity asking an injunction against the proprietors of Herrick Field in Cleveland.

H. MIRKIL,
Foulkrod, Sheppard, Portu and Alexander, Philadelphia, Pa.

[We append a note to Mr. Mirkil's letter only to emphasize its importance, and to express an earnest hope that all airport operators and those interested in the development of any aspect of air at all will read it carefully. The great importance of its subject matter will then be self-evident.—ED.]

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The Most Economical Plane

TO THE EDITOR:

Being a subscriber to your most valuable magazine, of course, I did not miss the predictions and criticisms of our best aircraft and engine designers and manufacturers.

It seems peculiar to me why none of them could come a little closer to what I would call the most economical airplane, which I don't think to be so far distant.

All those leaders wrote about the high cost of engines, their upkeep and repair. High cost of aircraft, their operating expense, and further, of the

amount of money spent on developing airlines. Also, their slow returns. It should be easy to put two and two together and visualize the ideal ship.

Having had a small part in developing a low wing monoplane, and reading German magazines on the efficiency of the low wing monoplane, and having kept in close touch with this particular type, I am inclined to believe that the most efficient plane would be a "low wing monoplane" with retractable landing gear, a Diesel motor for a power plant, and a controllable pitch propeller. All of which are now in use but have to be brought together to achieve the ultimate.

The "low wing monoplane" advantages are known in the industries. The retractable landing gear, of which our company has definite proof. The low fuel consumption and doing away with a terrific fire hazard, which are the main characteristics of the Diesel Motor. The controllable, reversable pitch propeller, which has been demonstrated by the Wasp-powered "Fokker Universal." The advantages of such a propeller are also known.

All these features combine in a three motored air liner should bring about low operating cost, and the resultant lower traveling rates for the airminded public, and above all, safety and reliability, for we all know that confidence must be instilled in the public.

The sooner the airline operators make up their minds to run real airlines and demand more economical ships, the sooner they will get the public into the air, instead of discouraging them with steep prices. They will then make money like other "Rapid Transit" concerns.

GEORGE D. RECKTEN,
Colorado Springs, Colorado.

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Coast Fueling Facilities

TO THE EDITOR:

In your issue of April 12th, you published a letter from a correspondent recounting his unfortunate experiences in flying a small flying boat from Washington to Miami in the early part of January this year. Your correspondent stresses the lack of fueling facilities along the Coast. In his particular case, bad weather apparently forced him to stop at points where no stop would have been made had weather conditions been more favorable. However, he is perfectly correct in his attitude that there is a large need for suitable facilities along the Coast.

No one is more anxious than we to have a chain of seaplane bases along the Atlantic Coast and anticipating no great immediate progress in this direction, we have gone to the limit of expediency, perhaps beyond, to create facilities such as to assure that coastwise seaplanes may at least be offered the necessary supplies of fuels and lubricants. At Charleston, S. C. we have installed a seaplane servicing barge completely equipped to fuel and lubricate seaplanes and ready to effect minor mechanical adjustments. This was done at considerable expense to ourselves and as an experiment to determine our future policy along these lines. Incidentally, we sent notice of our intention of constructing this barge to the leading operating companies and operators with a request that they contribute their opinions as to the desirability of such installation and to give such suggestions if they saw fit. No replies were received to this request. Among other points in the distributing area of our company where we normally stock aviation gasoline and oils are the following: Red Bank, N. J., Avon, N. J., Sea Girt, N. J., Atlantic City, N. J., Newcastle, Del., Annapolis, Md., Norfolk, Va., Elizabeth City, N. C., Washington, N. C., Morehead City, N. C., Wilmington, N. C., Georgetown, S. C., Charleston, S. C., Beaufort, S. C.

We agree with your correspondent that facilities along the Coast should be improved and we are trying to do our part and are willing to do more. It might be of value for AVIATION to create a file of information showing the points along the Coast where fueling and other services are available. As a practical suggestion, pilots who are not familiar with the Coast should determine in advance where fuel and oil are available and ascertain other facilities at such points. In this connection we will be very glad to assist pilots by furnishing such information as we have.

E. E. ALDRIN,
Manager, Aviation Department
Standard Oil Co. of N. J.

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Defeatists and the Industry

TO THE EDITOR:

I was very much interested in your excellent editorial in the April 18th number of AVIATION, "The World is NOT Coming to an End," particularly the third paragraph, which so clearly states the present situation.

It seems to me that any feeling of "defeatism" existing today can only be in the minds of those who have no knowledge whatever of the business in which they are engaged or who secretly do have knowledge but openly are not inclined to admit what they have learned as the result of their over-optimism and mistakes in the past.

This should be a period of thanksgiving for all those seriously interested in the read development of the aircraft industry. Due to the co-operatios of all branches of the government, the unprecedented financial support of the public, the universal patronagle of the entire press of the nation, the active technical participation of the country's leading manufacturing groups, we have found out in an almost unbelievably short time almost everything we need to learn regarding present types of aircraft, their construction, operation and limitations, and far more important, what improvements are desirable and necessary.

"What more could one ask"? is to my mind the question that should be brought to the attention of any so-called "defeatists."

W. W. KELLETT,
Philadelphia, Pa.
April 24, 1930

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Flying With a Pilot

TO THE EDITOR:

It seems to me that the aviation industry is overlooking one of its best opportunities, which I have mentioned to one or two of the representatives of the larger concerns. The average young man today has not the money to buy a new expensive ship. The older man hasn't the interest to buy one because he does not know enough about it and consequently is timid. However, the older man has made more money than the younger man and should be the better potential market. I believe there are many older men who would be interested in doing just what I have been doing if the idea were sold to them and the laws changed a little bit to meet their case.

I am forty-eight years old, but fortunately passed the physical tests for a private pilot's license and have been flying under instruction since November. There are many men who could not pass the physical tests and therefore could not, according to the law, be permitted to handle the controls even with a pilot. Many of these same men would, no doubt, have little interest in soloing. A straight flying with someone else doing the piloting is apt to become monotonous, many people would undoubtedly like the opportunity of handling the controls with a pilot always with them and with no idea of their soloing. According to the laws as I understand them, this cannot be done and therefore a good market is let go by. It seems to me that somebody ought to start something to have the laws changed so that older men could fly ships under instruction, but never with any intention of soloing, unless they were able to pass the private pilot's physical examination, and desired to do so. If they cannot pass it, they should not be prevented from handling the controls, always provided a competent pilot was with them. If this idea could be sold to older men and the laws changed to suit the conditions, it seems to me that a much larger field for the sale of airplanes and flying instruction would be opened up in the field where the greatest purchasing power is.

FRANKLYN FARREL, JR.
New Haven, Conn.

[We find ourselves in entire accord with Mr. Farrel's view. While ade-

quate physical standards must be exacted from airplane pilots who are actually to be in full charge of a plane, we feel that the present stipulation against the installation of a dual control in front of anyone other than a holder of a student permit is far too stringent, and has many unfortunate results for many actual or potential private owners, as well as for some airplane designers who lack the physical qualifications for a license.—Ed.]

Editorial Comment

FROM THE DAILY PRESS

Airplanes for All Purses

A CUT has been made in the prices of airplanes sold by two great competing companies. The obvious intention is to speed up demand. In California, the State which leads in the number of planes and pilots registered, a leading distributor recently failed. That does not mean that interest in flying has slackened in California, where there is an "open season" for planes all the year round. The aviation schools are enrolling more students than ever. Big transport companies are carrying 60 per cent of capacity.

It is significant that the market in used planes has been unusually good. A broker in Southern California reported February as the best month he had ever known. The price of new planes had been considered too high. Competing manufacturers have recognized that fact; hence the liberal reductions.

A subsidiary of the Cord Company made a slash in a well-known standard plane at the St. Louis show, and the Detroit show opens with cuts right and left by the Fokker Aircraft Corporation, which has close relations with General Motors.

The desire to fly private planes is growing. So practical a man as William B. Stout, consulting engineer of the Ford Motor Company, believes that "it is just as foolish to say that the plane will be only for the man of wealth as it was when the Dodge Brothers made that statement to Henry Ford about automobiles." Mr. Stout boldly adds:

We can eventually make a plane fool-proof enough so that a man can solo in five hours and fly home in ten, with the Department of Commerce's entire sanction.

Mr. Stout, in an article in the current AVIATION, declares that the public "wants the safest possible airplane at a cheap price." But he explains: "We must first solve the problem of the plane and then make this good airplane cheaply by quantity production." It is reasonable to look forward to the new plane that will be as safe to drive as an automobile. If Bert Hinkler, the Australian aviator, could fly from England to Australia in a "flivver" that could be folded up and put in a garage, it seems to be only a question of time when the cheap airplane will be seen in the sky.—NEW YORK TIMES.

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Foolhardy Flights

THE RETURN of spring is attended by feelings of unrest among the airmen. Ordinary journeys have no attractions for them; they yearn to go great distances and to take desperate chances. The possibility of performing an original feat is now remote, and so they plan flights known to be perilous. At least seven transatlantic and two transpacific flights already have been planned.

It is a thankless task to advise aviators that they may risk their lives for nothing. Nobody now remembers the names of all the flyers who have crossed the Atlantic or who have lost their lives in that perilous flight. Whether one or a dozen negotiate the crossing is a matter of public indifference. It is generally hoped that no foolish person will again attempt it until we have improved the airplane, but there is no way to stop suicidal enterprises.

The French air ministry probably will make an effort to prevent three French expeditions from leaving France on the westward crossing; but if the aviators are determined they will find a way. In the United States there is no law for putting aviators in jail until their venturous spirits cool. We can only watch them start and do what we can to rescue them when they get into trouble.

Scientists who attempt to explain human behavior are at a loss to account for the ocean-hopping craze. They know that some aviators have the same urge that prompted persons to go over Niagara Falls in barrels, but it seems to violate the strongest of human desires, which is to live.

—SEATTLE (WASH.) TIMES.

New Volumes

FOR THE SHELVES

Welding

AIRPLANE WELDING, *By J. B. Johnson; Goodheart-Wilcox Co., Inc.; 321 pages; $3.50.*

"WELDING," says J. B. Johnson, in his recently published handbook "Airplane Welding" (Goodheart-Willcox, 1929), "is an art, and . . . cannot be learned by applying a few rules and making certain motions." Practice is, of course, the essential factor in attaining proficiency in any art, but a careful study of texts such as the one under consideration may shorten materially the early stages of practical application by bringing to the attention of the beginner the mistakes and delays which are usually attendant upon his first efforts by trial-and-error methods alone. The book is of interest also to the man with welding experience outside the aircraft field, for, although the equipment and the methods are, in general, the same as those to which he may be accustomed, many refinements in technique are called for by this new and highly specialized form of the art. Unusual care and precision are absolute requirements, as failure of a single welded joint may mean the loss of airplane and crew. The responsibility of the airplane welder is very great, and it speaks well for the present state of the art that service failures of welded airplane structures are extremely rare.

The designer, also, may read this book with profit. Too often, as is pointed out in the text, drawings are sent to the shop which show two or more intersecting members, or surfaces, with the bare notation —"Weld"—appended. The joint in question may look very simple on paper, but unless it is given very careful consideration when originally laid out it may easily become a source of considerable trouble and expense to the shop. A practical welded joint must have not only the required structural strength, but it must be relatively easy to make by a welder of average ability. Seams must be so located as to be readily accessible to the torch without its affecting any adjacent parts. Consideration must be given to the relative thickness of the members to be joined, and to the effects on the remainder of the structure of local expansion and contraction caused by the welding op-

eration. Proper reinforcement of the joint should be provided as a part of the design, and thought should be given to the accessibility of the final assembly for inspection purposes. These, and many other points of interest to the designer are discussed in the text.

The book opens with a brief survey of methods of joining metal parts. Two general classes of fastenings are outlined—i.e., Mechanical Fastenings, including bolting, pinning, riveting, swaging, and seaming; and Thermal Fastenings, which include soldering, brazing, and welding. Materials and methods for the first seven of these types are covered very briefly, after which the author passes to the subject at hand. A number of chapters are devoted to descriptions and operating instructions for the various forms of commercial welding systems employed, both gas and electric. Equipment maintenance, and trouble correction are well covered.

The following section of the book includes a discussion of the various materials used in aircraft construction which are susceptible to welding methods. Composition, physical properties, and heat treatment of various ferrous and non-ferrous metals are given in some detail, together with a rather elaborate description of testing laboratory methods and equipment The latter is of interest to the general reader, but could have been somewhat curtailed without detracting from the value of the book as a welder's manual. The effects of welds on the basic properties of the materials joined are also studied at some length.

Practical information for the use of the designer, operator, and inspector constitute the remaining sections of the volume. Allowable stresses in joints of various materials are presented in tables and charts. Good and bad design practice for many of the component parts of aircraft structures, such as struts, end fittings, wing and landing gear fittings, wing beams, etc., are discussed and illustrated. For the shop man there are descriptions and discussions of various types of jigs and fixtures, heat treatment methods for parts, and notes on the repair and maintenance of welded airplane structures. Special instructions are given for the welding of a number of the non-ferrous materials such as aluminum (with suitable precautions as to the welding of certain of its alloys), Monel, Stellite, tungsten-carbide, etc.

The final chapter deals with the inspection of welded joints. The importance of thorough inspection is emphasized, and methods are outlined whereby material may be checked for correct composition, soundness, etc. Visual and mechanical methods of inspection are covered, and brief comment is made of the possibility of the inspection for hidden defects by means of X-rays. An Appendix includes (1) Underwriters Laboratory Rules for use of Gas welding systems, (2) methods of polishing and etching samples of steels for microscopic examination, (3) column formulæ, (4) some properties of tubing as columns from N.A.C.A. Technical Note No. 306, and (5) tables and charts showing the properties of various sizes of tubing.

One of the outstanding features of the book as a whole is in its generosity of illustration. Photographs and drawings are used profusely, and to good effect. They are well selected and help not a little to clarify the text. The illustrations of typical welding failures and defects are of particular interest.

The author, as Chief of Material Branch, U. S. Army Air Corps, at Wright Field has had access to the most recent developments in the field of airplane welding, so the subject matter presented may be considered as authoritative and up to date. The volume is well printed, is of convenient size, and is adequately indexed.—S. Paul Johnston.

Abstracts and *Reviews*

Propeller Tests

Tests of Five Metal Model Propellers with Various Pitch Distributions in a Free Wind Stream and in Combination with a Model VE-7 Fuselage; *By E. P. Lesley and Elliott G. Reid; N.A.C.A. Technical Report No. 326.*

In the design of propellers it is generally customary to assume that the axial velocity of air through the propeller disk is uniform. It has recently been demonstrated, however, that such is not the case; the velocity through the propeller plane is relatively small in the vicinity of the fuselage when the fuselage is of conventional form. The purpose of this investigation was to determine the importance of considering this feature in the design of propellers.

Five metal model propellers of three foot diameter, having the same plan form and blade sections and with approximately the same mean pitch, but with various radial distributions of pitch were tested in the wind tunnel at Stanford University. Their performance characteristics were determined both in a free air stream and with a model fuselage behind them. Propeller A had a uniform geometric pitch. Propellers B and C had the same form and pitch as A from the hub to the 10.8 inch radius, from that point to the tip the pitch of B gradually increased, and that of C gradually decreased. Propellers D and E were the same as A from the 10.8 inch radius outward; from that point toward the hub the pitch of D increased while that of E decreased.

Propeller A was first tested in an unobstructed windstream and its speed power coefficient determined for maximum efficiency. The other propellers were likewise tested, their blade settings being varied to give maximum efficiency at the same speed power coefficient as that determined for A with maximum efficiency. This blade setting having been determined, the propellers with that setting were subjected to the usual tests to determine their characteristics. That having been done, the entire procedure was repeated with the propellers in combination with a VE-7 model fuselage and stub wings. The distribution of velocity through the propeller plane was afterward determined by making pitot-tube readings at intervals along three radii, two vertical and one horizontal.

Results of the various tests were shown by means of plots of the power and thrust coefficient, C_P and C_T against V/nD, and of V/nD and n against the speed-power coefficient, C_{P_1}.

Tests in the free air-stream showed maximum efficiencies for A, D, and E of about 81% while B and C had a peak efficiency of close to 80%. When tested in the presence of the model fuselage, all propellers showed a decrease in peak efficiency from that determined by the free stream tests and an increase in V/nD for zero thrust. The decrease in efficiency was not the same for all propellers, however, E having the maximum value, 79%, for that condition.

To determine the angle of attack for the various sections of the five propellers, the inflow velocity was neglected and the radial velocity distribution assumed to be the average of the readings for the three radii. The angles for propeller E were small and nearly uniform and probably somewhere near the optimum values, while those for the other four were distinctly less favorable for high efficiency.

Comparison of these results with those for the unobstructed wind stream demonstrated clearly that the reduction of propeller efficiency due to the presence of an obstruction in the slip stream was minimized by giving the propeller a radial distribution of pitch similar to the radial distribution of air velocity through the propeller plane. Therefore, a propeller so designed that all its blade sections actually attain their optimum angles of attack at the condition of maximum efficiency is appreciably superior to the conventional constant pitch propeller for use in the presence of a slip stream obstruction.

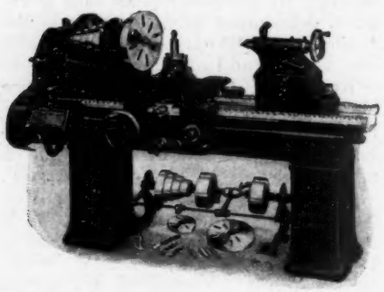
THE BUYER'S LOG BOOK

This Log is prepared by the editors of AVIATION *purely as a service to readers. All items are published free of charge, solely on their news value, and without any advertising consideration whatsoever. Manufacturers are invited to send in material for this section.*

New Large Swing Lathe

THE NEW 16-24 South Bend Large Swing Lathe is designed to meet the requirements of small plants that machine work of large diameter, as well as for machine shops, repair shops, service stations and general all-around machine work. By using a special form of turning tool a flywheel 24 in. in diameter can be machined on its face. A roll 16 in. in diameter can be machined between centers for its entire length as a roll of that size will swing over the saddle.

The lathe is a regular 16 in. lathe fitted with raising blocks to increase the swing from 16¼ in. to 24¼ in. over the bed. The raising blocks are firmly



24 in. swing lathe

fitted under the headstock, tailstock and compound rest. The compound rest raising block is graduated on the base so that the tool can be fed to the work at any angle desired. It is fitted with automatic cross and longitudinal feeds and is especially built for the cutting of screw threads. The lathe may be supplied with lathe chucks, drill chucks and other attachments which make possible a variety of work. It can be furnished in any length bed from 6 to 12 ft. and with countershaft drive or silent chain motor drive.

Angle-Steel Equipment

AMONG THE VARIED LINE of rigid, revolving and adjustable stools offered by the Angle Steel Stool Company, Plainwell, Mich., are included stools for the machinist with tool box and tray, and steel chairs and bench seats devised to meet special demands of different trade. Stools are equipped with comfortable, concave seats of heavy steel formed in one piece with turned-down edge and from 13½ in. to 15 in. in diameter. To insure greater comfort to the user who sits continuously in the same position, many are equipped with spring backs in sizes 6x12, 6x9 or 6x14. Most back rests are of steel, others are made of hardwood to match the seat.

In order that one stool may take the place of several of different heights, a line of stools is provided with legs adjustable every inch on inch centers. Any chair or stool can be furnished with rubber tipped feet or with casters. The frame and all other steel parts are finished in a dark olive-green enamel which is durable, while the wood seats and backrests are finished in either golden oak or mahogany. Special finishes are also obtainable.

G.E. Switches and Panels

THE MARKETING OF INSTRUMENT PANELS, switches and cables is announced by the General Electric Co. of Schenectady, as an addition to its line of aircraft accessories. The new panels will be designed according to the individual manufacturer's requirements and can be made either of molded compound known as "Textolite" or of metal. They can be furnished as blanks, drilled to specifications, or completely fitted out with the necessary instruments.

The switches include a low current type for use in cabin interiors, instrument panel illumination control and for controlling remote indicating devices; a high current switch for the control of landing lights; and a special pull type designed for engine starters. A completely radio shielded ignition switch is being built. The four different sizes of cables for electric wiring in aircraft range from No. 8 to No. 2 A.W.G.

New Precision Reamer

A LINE of precision reamers with long floating pilots has just been brought out by Chadwick & Trefethen, Portsmouth, N. H. The most revolutionary of these is the aligning Critchley angle-blade reamer with a long spindle, which replaces the lower end nut and which supports a snugly fitted pilot. The manufacturers claim that this new reamer, because of its long pilot, will align widely separated centers.

U. S. Drills

AN ADDITIONAL ROLLER BEARING is now being included in the chuck spindles of the ⅝ in. and ¾ in. heavy duty drills manufactured by The United States Electrical Tool Company, Cincinnati, Ohio. According to company statement, this provides for the double thrust which occurs in cylinder reconditioning work, resulting in easier operation. Bohnalite housings are now being used on all ¼, 5/16 and ⅜ in. portable electric drills and also on the No. 1 and 2 sizes of screw drivers, valve grinders and tappers. The new design of the three drills permits removing one side

U. S. Drill with side of handle removed for repairs

of the handle and housing end in one piece. This arrangement makes the switch, wiring and commutator more easily accessible when servicing becomes necessary. No increases in price have been made for the new model.

Trade Catalogs

► *Air transportation and the community.* A 24-page booklet recently published by Merick-Wildish & Co. discusses the advantages which air transportation offers a community. The airport planning and construction service of the company is outlined and photographs are included which illustrate modern municipal airport layout and construction.

► *Ryan planes.* The transportation problem of the executive is stressed in a recent bulletin published by the Ryan division of the Detroit Aircraft Corporation. The Foursome, Brougham for Six and Wasp Brougham, Ryan's new 1930 planes, are featured and illustrated in the catalog.

► *Curtiss military aircraft.* The story of Curtiss achievements is told in a new 19-page catalog of the above title which also describes the Curtiss military craft—the Fledgling, Falcon, Hawk and Condor. Photographs of these planes and of the company's factories and laboratories illustrate the booklet. The account is printed on a four-section page in English, Spanish, French and German.

► *Type ADA floodlight.* Bulletin 2201, attractively illustrated in color and devoted to describing the Type ADA floodlight, was recently issued by Crouse-Hinds Company.

Johnson Tail Wheels Prove Timken Advantages

High speeds of rotation, weight, shock and severe thrust loads make bearings as vital in airplane tail wheels as they are in landing wheels.

That is why Johnson tail wheels, manufactured by Johnson Airplane & Supply Co., Dayton, Ohio, are Timken Bearing Equipped.

The manufacturers have found that by means of the exclusive combination of Timken tapered construction, Timken *POSITIVELY ALIGNED ROLLS* and Timken-made steel they can build a tail wheel that combines the ideals of light weight and great strength . . . a wheel that the severest radial, thrust and shock loads cannot harm . . . a wheel that is always firmly seated and cannot wabble . . . a wheel that helps to reduce take-off time . . . that picks up landing speed instantly and so protects the tire . . . a wheel with bearings completely protected from dirt, water and grit and which can be kept properly lubricated with very little attention . . . a wheel that increases ground maneuverability under all conditions.

On planes of all types—from the smallest to the largest, Timken-equipped tail wheels are serving with maximum safety, economy and endurance.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

TIMKEN *Tapered Roller* **BEARINGS**

Here's Another Way
Airwheels Increase Safety

OF course these big, soft, rolling cushions of rubber increase the safety of landing on soft fields—they reduce the hazards of forced landings on sand, mud or plowed fields. They do all this because they need only 5 to 15 pounds pressure—they spread out—mushroom—when they touch the ground.

But they bring another kind of safety by protecting the mechanism of the plane. They absorb the jolts and jars of taxying—roll the plane across the field smoother than you could ride on a good road in a car. That means a lot in reduced maintenance—in the course of hundreds of take-offs and landings. It's a big factor in preventing connections from jarring loose. It does a lot to save the plane.

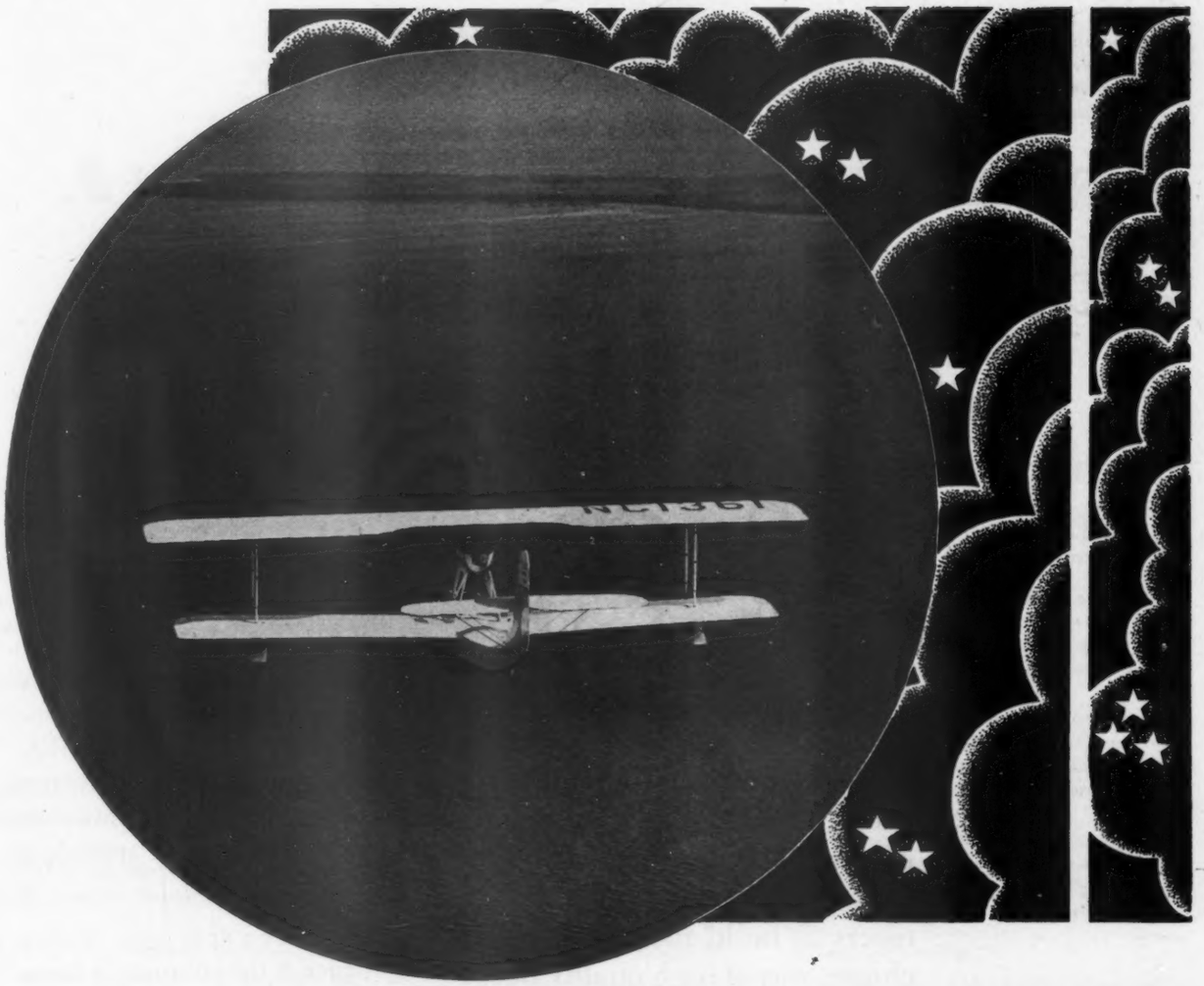
Airwheels mount directly on the hub. There is no other wheel—therefore there can be no wheel failures. Goodyear builds both the Airwheels and the hubs, with special, internal brakes, self-centering—the most desirable braking action ever devised for airplanes.

To prove the safety of this newest Goodyear contribution to aviation, almost every thinkable test has been tried with Airwheels. It's almost impossible to nose over on any field. They have made cross-wind and down-wind landings. Deliberate ground loops are performed with perfect safety, because Airwheels permit unusual side deflection and side loading as well as vertical.

For further facts, write to Goodyear—Aeronautics Department, Akron, Ohio, or Los Angeles, California. Goodyear Airwheels are now made for planes weighing from 1,000 to 20,000 pounds.

GOODYEAR

EVERYTHING IN RUBBER FOR THE AIRPLANE



Above All Else a Flying "Boat"

For safety on the water and performance in the air, a flying boat must be first a "boat", seaworthy in every respect. It must possess all those qualities which experienced yachtsmen demand, and should be designed by a naval architect. The flying ability of the boat is then the responsibility of an aeronautical engineer.

The stamina, gracefulness, and easy maneuverability of the Viking, both on the water and in the air, are the achievements of Louis Schreck, who was first a yacht designer, then an aeronautical engineer working with naval architects.

Moderate in size, unequalled by others in the same price range, the Viking is the result of fifteen years effort to perfect a flying boat equally at home on the water and in the air — seaworthy — airworthy. The Viking is built in America and powered with a 225 h. p. Wright J-6 engine.

Also makers of the Kittyhawk Aeroplane—send for our booklets describing the Viking or Kittyhawk.

THE VIKING FLYING BOAT COMPANY
89 Shelton Avenue, New Haven, Conn.
Miami Hanger — Causeway Island

VIKING FLYING BOAT

This is one of a series of advertisements directed originally to advertising men in an effort to make industrial advertising more profitable to buyer and seller. It is printed in these pages as an indication to readers that McGraw-Hill publishing standards mean advertising effectiveness as well as editorial virility.

Squelching another whispering campaign—

"Look out for that company, it's slipping," said the whisperers. Its product, an assembled unit sold to manufacturers to build into their machines, was of high quality but had been sold only through salesmen and direct mail.

Sales *were* falling off. The market, conscious of the gossip, was suspicious of the financial strength of the seller. This increasing sales resistance was undermining the morale of the sales staff.

With this serious situation facing it, the company called in an advertising agent who recommended an emergency advertising campaign in a McGraw-Hill publication covering the particular market. The program, the first publication advertising ever used by this company, consisted of color spreads in every issue.

That was only a year ago. Today, as evidence of the company's comeback, sales are not only mounting but the advertiser's chief competitor has offered to sell out to the new advertiser. *From bottom place to top position in recognition in one year.*

MORAL: Selling is not a choice between salesmen, publication advertising and direct mail but a matter of co-ordinating all three and using each on a basis of the job to be done.

McGRAW-HILL
PUBLICATIONS

New York Chicago Cleveland Detroit Philadelphia St. Louis
Greenville San Francisco Boston London

AVIATION INSURANCE PROTECTION

facts about Barber and Baldwin, Inc. Service

Established 1922, reducing insurance rates by approximately 25%, raising limits of indemnities and broadening forms of insurance protection.

FIRST to supply, in 1922, comprehensive aviation insurance under an all-American combination policy form, than which no broader form exists today.

FIRST to construct and supply aviation finance insurance, dealers' and manufacturers' blanket policies, airport and airmeet liability policies, and policies covering beyond the United States.

FOREMOST in constructing and supplying, at a moment's notice, special forms of coverage to suit unique requirements.

ALONE in maintaining an engineering and advisory service covering the entire country and serving all interests.

ALONE in having developed a world-wide organization whereby American exporters of aircraft may secure adequate insurance and in addition, foreign local engineering and advisory service.

ALONE in having paid more aviation claims than all other aviation insurance organizations.

ALONE in being favored with the major part of all available aviation insurance business.

SAFETY ENGINEERING

Increases your Profits
Improves Public Confidence
Makes Insurance Easier

Our Engineering Safety Service, founded 1922 and now operated by our affiliated Aero Engineering & Advisory Service, Inc., renders constructive advice to our policy-holders.

Our Engineers, resident at strategic points throughout the country, are specially qualified and trained to cooperate in improving safety. They assist policy-holders on request.

Our Superintendent Engineers cover the entire country by air and on our own aircraft. They are highly qualified Engineers and Pilots of national reputation. Their knowledge and experience are at your service.

This Service (free to our policy-holders - reasonable charges to others) is being used by air operators, both large and small, in the United States, Canada, Mexico, West Indies, Colombia, Brazil, the Argentine and Chile.

EXPLANATORY BOOKLET
FREE ON REQUEST

The foregoing facts are the result of maintaining consistently over a long period of years B. & B. SERVICE, STABILITY AND SECURITY

Full Particulars upon Application to

BARBER & BALDWIN, Inc.

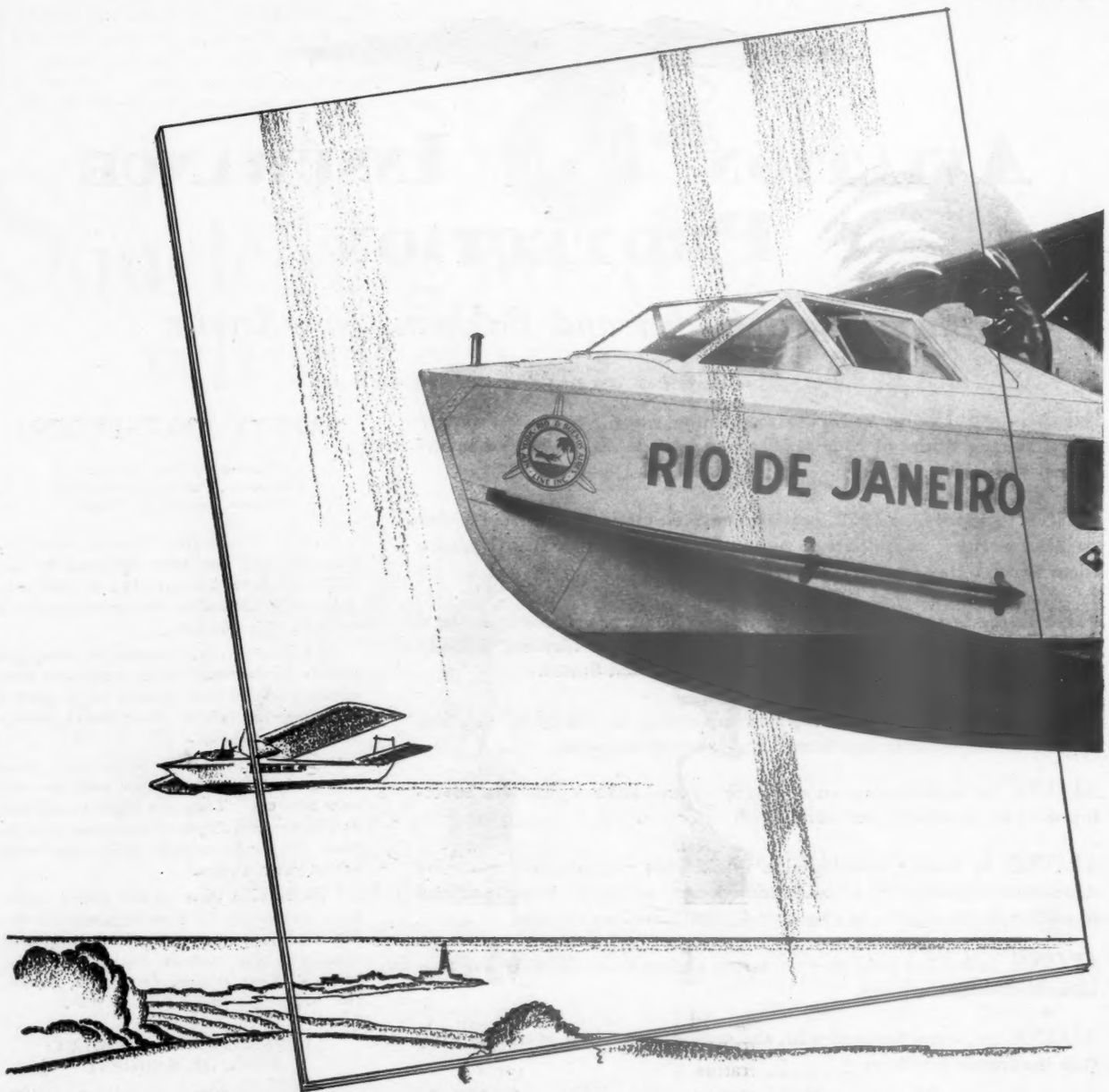
Est. 1922 A New York Corporation

Underwriting Agents for the following Companies:

Aero Insurance Company
Liverpool & London & Globe Insurance Company
Star Insurance Company of America
Fire Association of Philadelphia
The Reliance Insurance Company
The Northern Assurance Company
The Pennsylvania Fire Insurance Company
The Mercantile Insurance Company of America
Royal Insurance Company
Queen Insurance Company of America
American & Foreign Insurance Company
Aero Indemnity Company
Globe Indemnity Company
Federal Union Insurance Company
Constitution Indemnity Company
Victory Insurance Company
The London & Scottish Assurance Corporation
North British & Mercantile Insurance Company
The Homeland Insurance Company of America
The Commonwealth Insurance Co. of New York
Newark Fire Insurance Company
U. S. Life Insurance Company

CHANIN BUILDING *122 East 42nd St.* **NEW YORK**

Telephone: Lexington 4316-7-8 **Cablegrams: Avbar, New York**



CLEAR UNDISTORTED VISION *plus* SAFETY

Ask for complete information about laminated glass for aircraft use, including special *bent* laminated glass for cock-pit windshields, obtainable through Warehouses of the Pittsburgh Plate Glass Company in all leading cities.

DUPLATE
Fine plate glass. Laminated thickness ¼ in. weight per sq. ft. 4.8 oz.

DUOLITE
Flat-Drawn Sheet Glass. Laminated thickness 7/32 in. Weight per sq. ft. 4.5 oz.

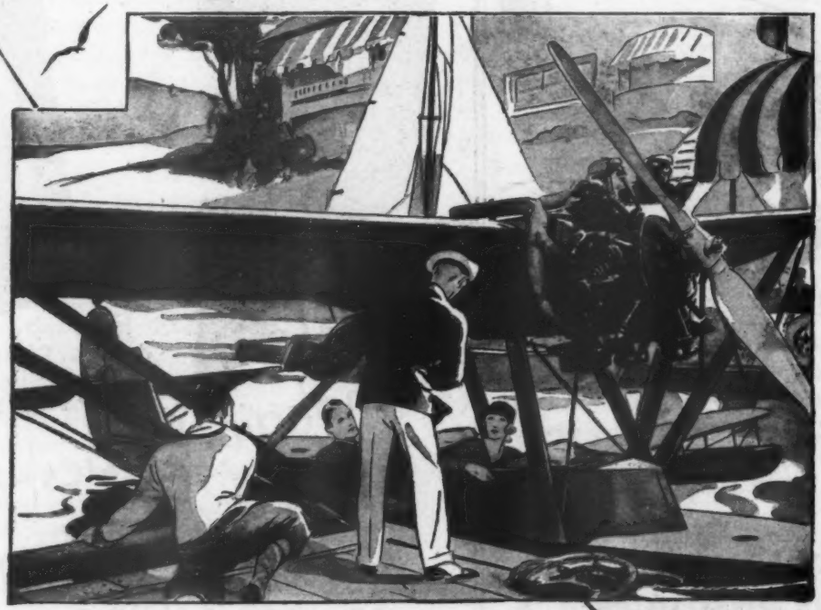
AEROLITE
Thinnest laminated glass made. Thickness 1/8 to 3/16 in. Weighs per sq. ft. 2.4 to 3.6 oz.

Safety in the air—as well as on the ground. The same safety that you find in fine automobiles. Safety from any chance dangers of scattered broken glass. Windshields of clear polished Duplate equip this great ship of the New York, Rio & Buenos Aires Line Inc.—Commodore No. 2, built by the Consolidated Aircraft Corporation. Duplate was chosen because of its freedom from distortion, as well as its recognized non-shattering protection.

Duplate

CORPORATION
GRANT BUILDING, PITTSBURGH, PA.

. . a new thrill for passengers . . . a speedboat that flies



EASTMAN *Flying Yacht*

Passenger-hopping with an Eastman Flying Yacht offers new opportunities for profit to operators near lakes or sea side. ¶ Passengers are attracted by over-water flying. They enjoy the thrill of skimming the surface and mounting quickly into the air, without dust and dirt. And they like to know that a continuous "landing field" is always below. That is one reason Eastman operators can charge *twice the regular tariff for every ride.* ¶ The Eastman accommodates three passengers and pilot in comfort. On the water it steers like a boat, and can be quickly brought around for loading and unloading—which means more trips per hour. In take-off and performance, it compares with a sport-plane. It leaves the water in 8 to 12 seconds—climbs 1000 to 1200 feet per minute. ¶ Powered by a 170 H. P. engine the Eastman lists at $9985. Its all-metal hull and rugged construction throughout assure long life and dependable service. ¶ The summer months will bring a golden harvest to Eastman operators. Write for our illustrated catalog and complete information. Our sales franchise will interest dealers.

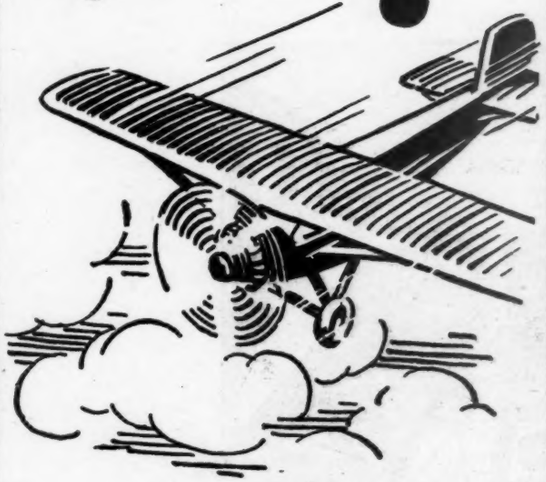
EASTMAN AIRCRAFT CORPORATION
RYAN AIRCRAFT CORPORATION
LOCKHEED AIRCRAFT CORPORATION
AIRCRAFT PARTS CO., INCORPORATED
PARKS AIR COLLEGE, INCORPORATED
PARKS AIRCRAFT CORPORATION

DETROIT AIRCRAFT

FORT AND CAMPAU STREETS, DETROIT
Chanin Bldg., New York :: Roosevelt Bldg., Los Angeles

BLACKBURN AIRCRAFT CORPORATION
AIRCRAFT DEVELOPMENT CORPORATION
MARINE AIRCRAFT CORPORATION
GROSSE ILE AIRPORT, INCORPORATED
GLIDERS, INCORPORATED
DETROIT AIRCRAFT EXPORT CORP.

Safe!



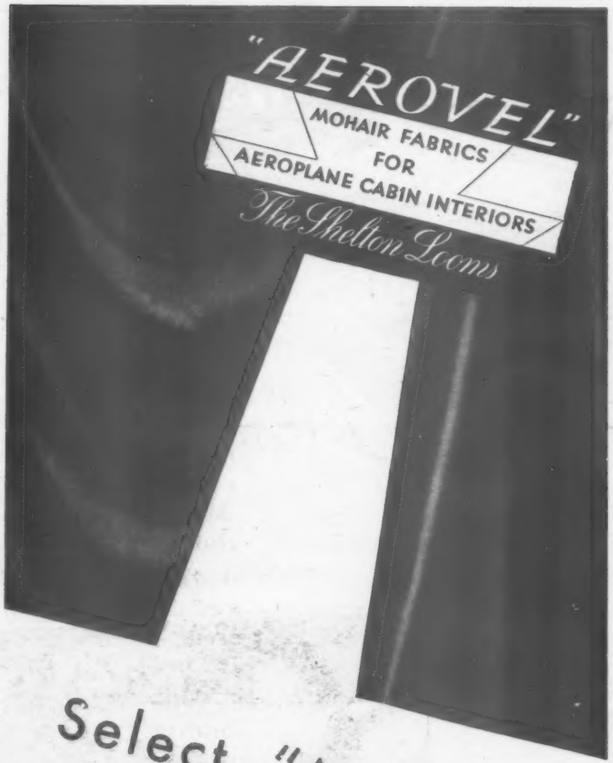
Where there is no landing there must be no failure.

For SPRINGS of any kind, of any material, for any purpose in motor, controls or landing gear, use

GIBSON-SPRINGS

WM. D. GIBSON CO.
1800 Clybourn Avenue
CHICAGO, ILL.

SEND FOR OUR CATALOGUE



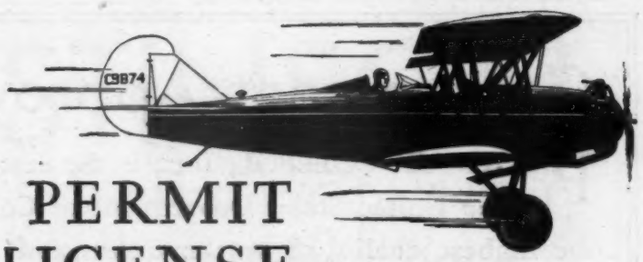
Select "Aerovel" mohair fabrics—"for added attractiveness in cabin plane interiors."

The Shelton Looms

AEROPLANE FABRICS DIVISION

ONE PARK AVENUE, NEW YORK

Mid-western Representative:
J. E. Menaugh Company
4618 Kenmore Avenue
Chicago, Illinois



FROM STUDENT PERMIT TO TRANSPORT LICENSE IN ONE PLANE . . . . . TRAVEL AIR

IN the files of Curtiss-Wright are scores of unsolicited letters testifying to the remarkable performance of Travel Air biplanes in all kinds of service. Recently the following was received from Mr. Walter D. Mauk, president of the Western Oklahoma School of Flying.

"I purchased an OX5 Travel Air on January 23, 1929, while I was learning to fly. I soloed in this ship and with it secured my private, limited commercial and transport licenses.

"I've flown it more than 500 hours, in student instruction, on exhibition and barn storming flights. The plane has been exposed to all sorts of weather—flying through rain, sleet and snow. There has never been a structural failure of any kind, and the only replacements were shock cord and a tail skid. I've flown every standard make of 3-place plane and none compares with Travel Air for maneuverability, sturdy construction and reliability."

Why have hundreds of other pilots praised the airworthiness of the Travel Air? Simply because all Travel Air planes are right in design, honestly constructed, and real aircraft values.

There's a Travel Air for every purpose—for student instruction, exhibition flying, sightseeing, mail and express, crop dusting and photographic service. Biplane models can be had with speeds up to 132 m. p. h., payload capacities up to 780 pounds and cruising ranges up to 690 miles.

The Travel Air 3-place biplane is equipped with Wright Whirlwinds of 225 or 165 h. p., with 150 h.p. Axelson, 110 h. p. Warner Scarab, 100 h. p. Kinner or Curtiss OX5 engine—thus permitting a wide range of power choice.

You can't go wrong in choosing a Travel Air—sponsored by Curtiss-Wright, the world's oldest and largest flying organization. The new low prices now in effect make these planes even greater values. Complete information, with details of operating costs will be sent you gladly. Write today to Dept. T-73.

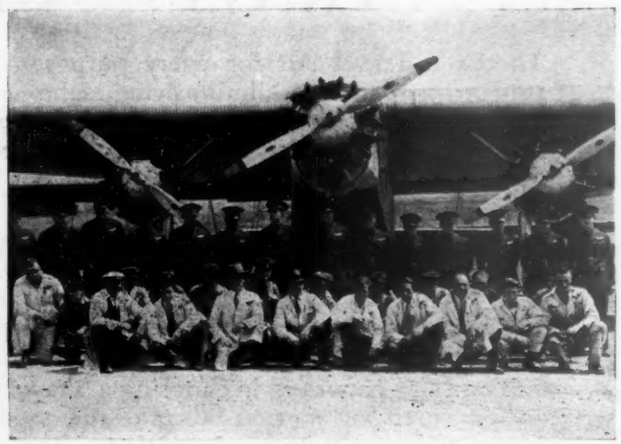
TRAVEL AIR COMPANY
Division of CURTISS-WRIGHT
27 West 57th Street · New York

Factories: Wichita, Kans., Garden City, N. Y., Bristol, Pa., St. Louis, Mo. Buffalo, N. Y., Baltimore, Md.

A PLANE FOR EVERY PURPOSE TRAVEL AIR

Government Approved Repair Station

PARKS AIR COLLEGE, Inc., is the first repair depot to be formally approved by the United States Department of Commerce. Federal approval assures you the highest quality of workmanship and renewal of the license on the plane you intend to rebuild or recondition.



Parks Air College flying and mechanical staff.

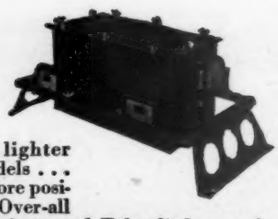
For Operators Anywhere

Parks can do repair work more economically and *far more promptly* than it can be done in inadequate home field shops. All our foremen have received recent training in the factories of Ford, Pratt & Whitney and Wright. Charges for shipping or ferrying planes to Parks Air College are more than equalized by the low scale of prices. For estimates on any type of work write, telephone or wire.

PARKS AIR COLLEGE
REPAIR DEPOT
DIVISION OF DETROIT AIRCRAFT CORPORATION
PARKS AIRPORT, E. ST. LOUIS, ILL.

THE NEW
RCA
AIRCRAFT
BEACON AND
WEATHER RECEIVER

RCA
AIRCRAFT
BEACON RECEIVER
Model 1286



ALMOST one-third lighter than earlier models . . . with improved and more positive remote control. Over-all efficiency considerably increased. Takes little space in the plane. A receiver that is entirely stable.

Utilizing the new screen-grid and power amplifying Radiotrons for the reception of Beacons and Department of Commerce Radio Broadcasts of weather and landing conditions.

Weather and landing conditions along the routes will be instantly available to pilots at all times . . . through the use of this receiver in the plane.

RADIOMARINE CORPORATION
OF AMERICA

66 BROAD STREET NEW YORK

1599 St. Clair Avenue	Cleveland, Ohio
433 South Spring Street	Los Angeles, Cal.
512 St. Peter Street	New Orleans, La.
808 N. W. 18th Street	Fort Worth, Tex.

Inquiries should be addressed to nearest office

HIGH GRADE
Gears — Cams — Precision Parts

INDIANAPOLIS TOOL & MFG. CO.
INDIANAPOLIS, INDIANA

Jig around which is built the strong steel framework of the Stinson fuselage. This fuselage is welded practically as a unit of great strength.

STINSON

210 H. P. LYCOMING
4 Place Cabin Plane
$5775
with Electric Self Starter

In this modern shop, a part of the Stinson plant, the small metal parts are made and finished with micrometer accuracy.

Part of the metal working department, where the gas tank, cabin panels, doors, cowling and sheathing are produced.

Here Stinson wings are carefully built by hand. Stages show from beginning to point of covering and assembling.

EASIER TO COMPETE WITH THAN AGAINST

There is nothing on the market that compares with this Stinson plane in value and price. There is no reason for paying more for less. National advertising is making the general public conscious of the foregoing two facts. The result is an unprecedented demand at the Stinson factories. Not only does Stinson dominate the market with the greatest value, but Stinson is *creating* consumer demand through its national advertising. Thousands of new buyers realize now for the first time that there is a plane which they can easily learn to fly, and can operate with comfort, safety, and economy. Back of Stinson's present program is a farsighted policy, financial strength, manufacturing resources and production methods that constitute a solid foundation insuring permanency. Stinson will continue to grow. Its leadership is assured. Those who have the Stinson franchise will share in this success and profit.

Stinson Aircraft Corporation, Wayne, Michigan
Division Cord Corporation

4-Pass.—225 H. P. Wright—$8,495 • 4-Pass.—225 H. P. Packard Diesel—$8,995 • 4-Pass.—300 H. P. Wright—$10,495
300 H. P. Wasp—$10,695 • 6-Pass.—300 H. P. Wright—$10,995 • 300 H. P. Wasp—$11,195 • 8 Pass.—425 H. P. Wasp—$15,995
Stinson Airliner—10-Pass. Tri-Motored Transport—$23,900 • Prices F. O. F. Wayne, Mich. Equipment other than standard, extra

DEALER franchise still open for right men in some localities

Angle Steel Equipment

for Factory, Shop and Office

Angle and Sheet Steel

Stools — Chairs — Desks — Bench Legs — Tables — Benches — Cabinets — Trucks —Machine Tenders—Bins—Pans.

Write for Catalog "C-AV" on your letterhead

Agents and Dealers in Principal Cities

Angle Steel Stool Co., Plainwell, Mich.

Send for Catalog

SEAPLANE FLOATS

FLYING BOAT HULLS

SEYMOUR J. BAUM, Inc.

268-288 Albion Street Elmhurst, L. I.

PITCAIRN AIRCRAFT

For Air Mail use . . . . . **MAILWING**

For Sport or Business use . **SPORT MAILWING**

PITCAIRN AIRCRAFT, Inc.

Pitcairn Field, Willow Grove, Pa.

AEROL

Shock Absorbing Landing Struts

No other part of an airplane is built with more care, precision and finer materials than are Aerol Landing Struts. Built by The Cleveland Pneumatic Tool Company, Cleveland, Ohio. ¶The Company also offers a complete line of fine air-operated hammers, drills and accessories.

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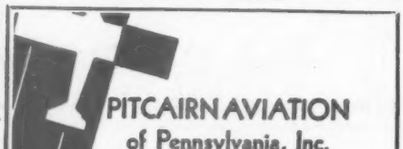

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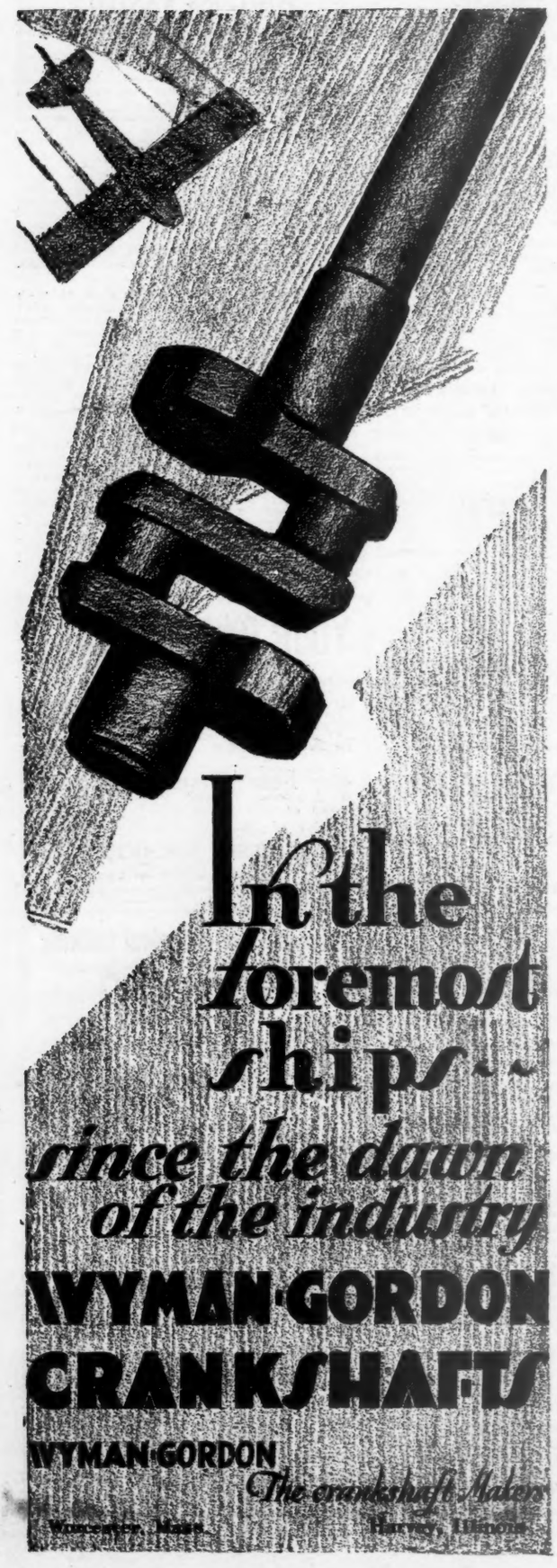

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From Chicago to San Francisco—in 20 hours—by air. That is the new passenger, mail and express service inaugurated by the Boeing System with its big planes which carry eighteen passengers and their baggage or the equivalent weight in passengers and mail.

Three 525 horsepower Pratt and Whitney Hornet engines provide power and speed. Two Scintilla Aircraft Magnetos on each engine insure dependable ignition for this fast 2000 mile trip.

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Contractors to the U.S. Army and Navy
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The Boeing, Model 80-A Tri-Motored Transport. Scintilla Aircraft Magnetos used exclusively.

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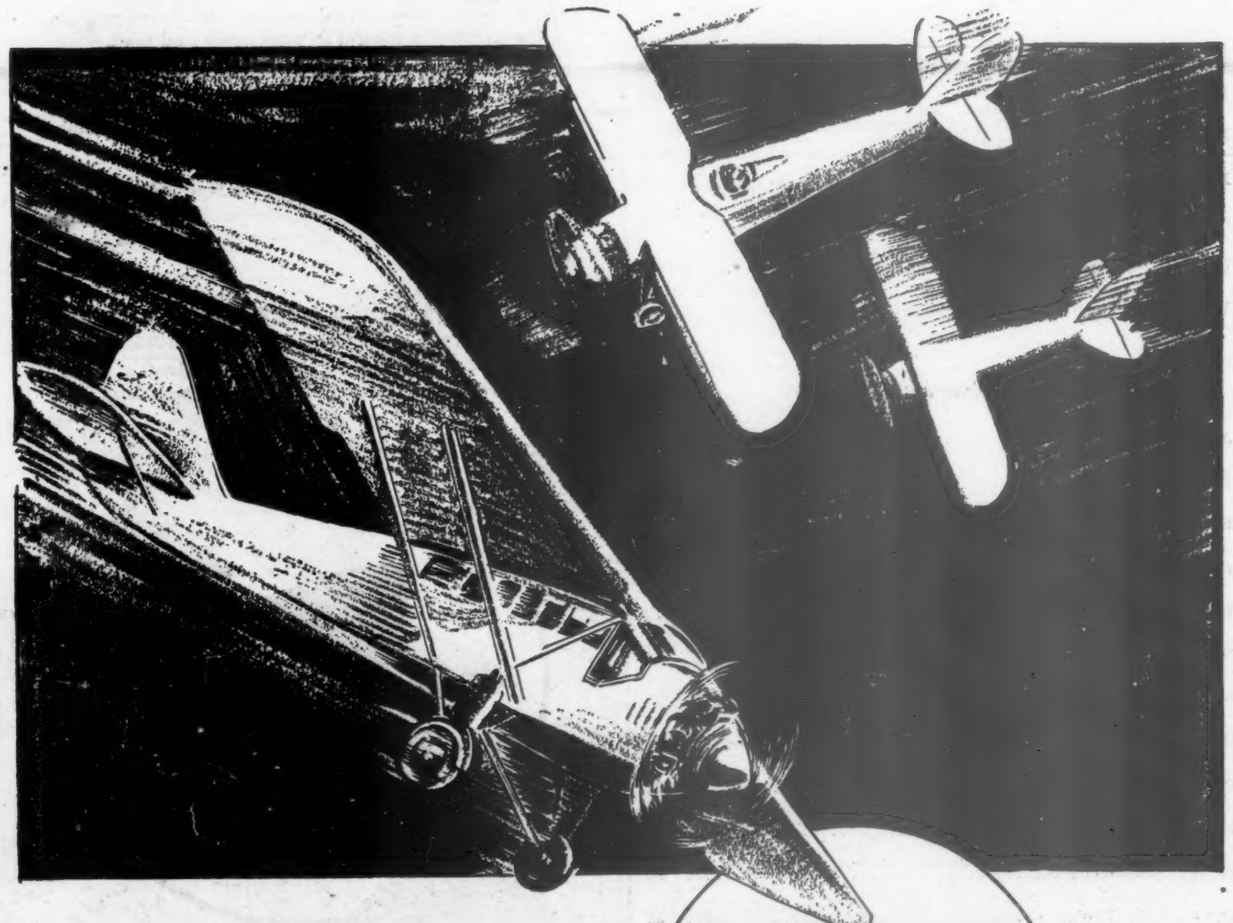

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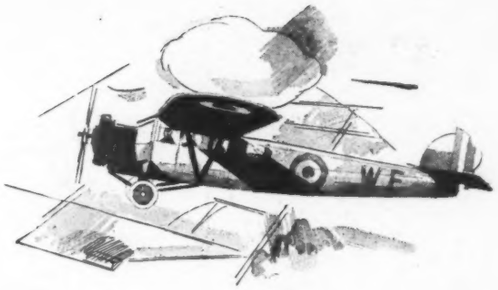

13 more Fairchilds to speed the mapping of an Empire from the air

FLYING high over rich farm lands, populous industrial centers, villages, lakes, streams and wooded areas, the surveyors of modern Canada are charting the entire vast reaches of the Dominion. The Department of National Defence and Department of the Interior are jointly responsible for this gigantic pioneering venture. It is the most extensive aerial mapping undertaking ever attempted.

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During March, seven Fairchild "71's" were delivered to the Department of National Defence and six more are on order for April delivery. These orders raise to 34 the number of Fairchild cabin monoplanes purchased by the Department and are eloquent testimony of their suitability for Canadian conditions.

They also use their Fairchilds for official transport, coast patrol, air mail and many miscellaneous purposes. In addition, more than forty Fairchilds are owned and operated in Canada by commercial operators and industrial organizations.

May we send you more information about the Fairchild 71, the airplane that has pioneered commercial aviation not only in Canada but Mexico, Peru, Chile and the United States?

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for better valve cooling, greater rocker arm security and full protection from weather . . . . .

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This construction is only one of dozens of Pratt & Whitney features which contribute that dependability for which the famous "Wasp" and "Hornet" engines are universally known.

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